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Realizing a cloud-enabled economy in Japan:

How cloud drives economic and societal impact through micro, small, and medium-sized businesses

2023

By 2030, MSMEs can deliver greater societal value in a cloud-enabled Japan

Across key sectors[i] this opportunity is expected to represent:

¥ 1.9 trillion combined annual productivity benefits unlocked through cloud-enabled MSMEs in healthcare, education, and agriculture

This represents a 17% increase on current levels

5.2 million people in Japan employed by cloud-enabled MSMEs within healthcare, education, and agriculture

60 million telehealth consultations using cloud would be supported by MSMEs' services

4 million school students would be engaging in online learning via cloud-enabled MSMEs

1 in 3 farms would be using cloud-enabled precision agriculture technologies supported by MSMEs

MSMEs is the abbreviation of micro, small, and medium enterprises.
Current values are annual 2022-2023 values based on the latest available data.
i. Key societal sectors are healthcare, education, and agriculture.

Overview

Micro, small, and medium enterprises (MSMEs, businesses and startups with between 1 and 250 employees)[1] are a major driver of economic performance. In Japan, MSMEs collectively account for over 99% of all firms, 69% of the private sector labor force and around 50% of Gross Domestic Product (GDP).[2,3] MSMEs are also a major source for innovation and disruption in the economy, leveraging both 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 a 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), 68% of all businesses across Japan now utilize 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 – only 4% of Japanese businesses use AI. Cloud technologies have most profoundly impacted MSMEs by allowing them to start, operate, and scale their operations more effectively.

The use of cloud technology by MSMEs is expected to become increasingly widespread, advanced and mature. With continuous advancements in technology, MSMEs 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 characterized by high levels of cloud adoption across Japanese businesses. It is anticipated that under this scenario, 90% of all businesses would adopt at least a basic level of cloud technology.[4,5] For many businesses, however, this represents only the beginning of their cloud technology journey. The escalating sophistication in cloud technology beyond basic applications will be a pivotal driver for economic growth in the future. As MSMEs tap into advanced cloud functionalities, such as AI, big data analytics, and serverless computing, they can foster innovation, streamline operations, and customize consumer experiences at global scale. These advanced uses can unlock new revenue streams, catalyze the birth of novel business models, and enhance global competitiveness, collectively underpinning the future of the digital economy.

By 2030, a cloud-enabled Japanese economy is expected to deliver even greater societal impact by supporting MSMEs to produce novel, new products and solutions or augment their existing operations. In certain societal sectors, namely health, education, and agriculture, this annual contribution is expected to reach ¥1.9 trillion. Not only that, but by 2030, cloud-enabled MSMEs are expected to support 60 million remote health consultations, four million school students to access online education, and one in three farms access more efficient and sustainable farming practices in Japan. Cloud-enabled MSMEs are also heavily involved with developing solutions to transition the economy towards more a more sustainable future and designing digital finance solutions (through 'fintechs') that are helping to support better financial inclusion and wellbeing.

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[1] The term 'MSME' is used instead of small-to-medium businesses (SMBs), a term commonly used to refer to similar sized businesses, to more explicitly include micro and startup business in the definition. MSME terminology is used by both the Organization for Economic Cooperation and Development (OECD) and the United Nations (UN).
[2] OECD (2022), Financing SMEs and Entrepreneurs 2022: An OECD Scoreboard.
[3] OECD (2023) value added by firm size
[4] Gartner (2022), The future of cloud computing in 2027: From technology to business innovation.
[5] Gartner (2021), Gartner says cloud will be the centerpiece of new digital experience.

While these benefits are substantial, the opportunities of the cloud-enabled economy require action. To unlock this potential, Japanese businesses and governments will need to collaborate to foster the continued adoption and maturity of cloud usage. Businesses can achieve this by:

- identifying how cloud technology can help them scale and deliver global impact
- investing in embedding cloud technology into their strategy; and
- developing a migration plan and training employees to leverage the benefits of cloud technology.

Japanese governments can support businesses in achieving a cloud-enabled economy by:

- prioritising cloud technology education across all levels
- investing in digital infrastructure to ensure innovation can continue unimpeded; and
- leading by example through promoting cloud adoption across all levels and divisions of government.

1 The cloud-enabled economy

Cloud technology has changed the way many businesses operate, particularly for MSMEs (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.

## 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 centralized 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 MSMEs 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 specialized technology solutions
- increasing computational power of ordinary devices; and
- enhancing security and resilience.[8]

The Accenture societal impact survey of cloud-enabled MSMEs conducted for this report indicates that the ability to save time, improve security and resilience, and reduce overhead costs are the features of cloud technology that are most impactful to MSMEs (see Figure 1).

Figure 1: The most significant benefits of cloud technology for MSMEs in Japan

Average % of cloud-enabled MSMEs across several industries in Japan that find cloud somewhat or extremely significant in providing a particular benefit
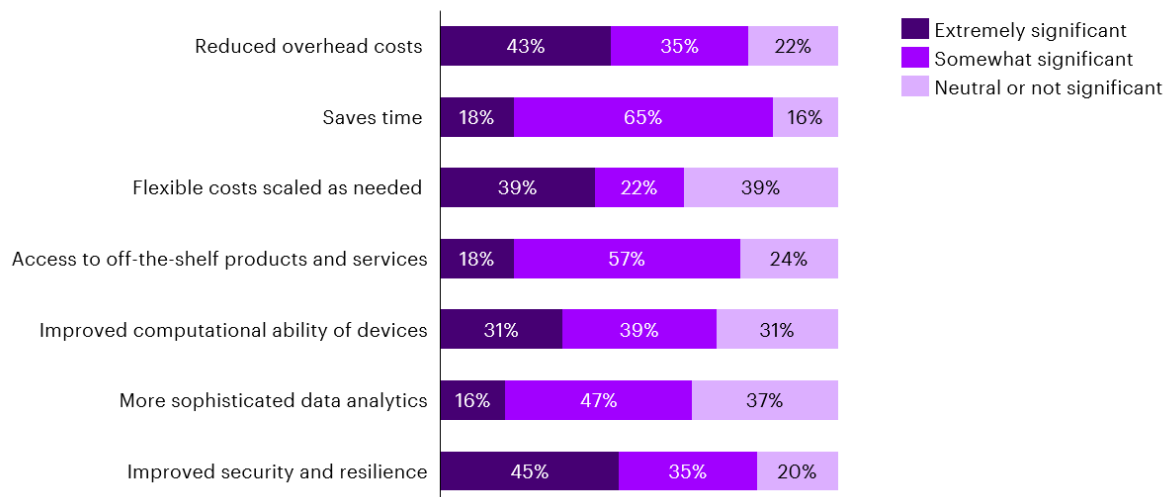
Source: Accenture societal impact survey (2023), n = 49. 'Neutral or not significant' includes responses of neutral, somewhat insignificant, and not significant at all.
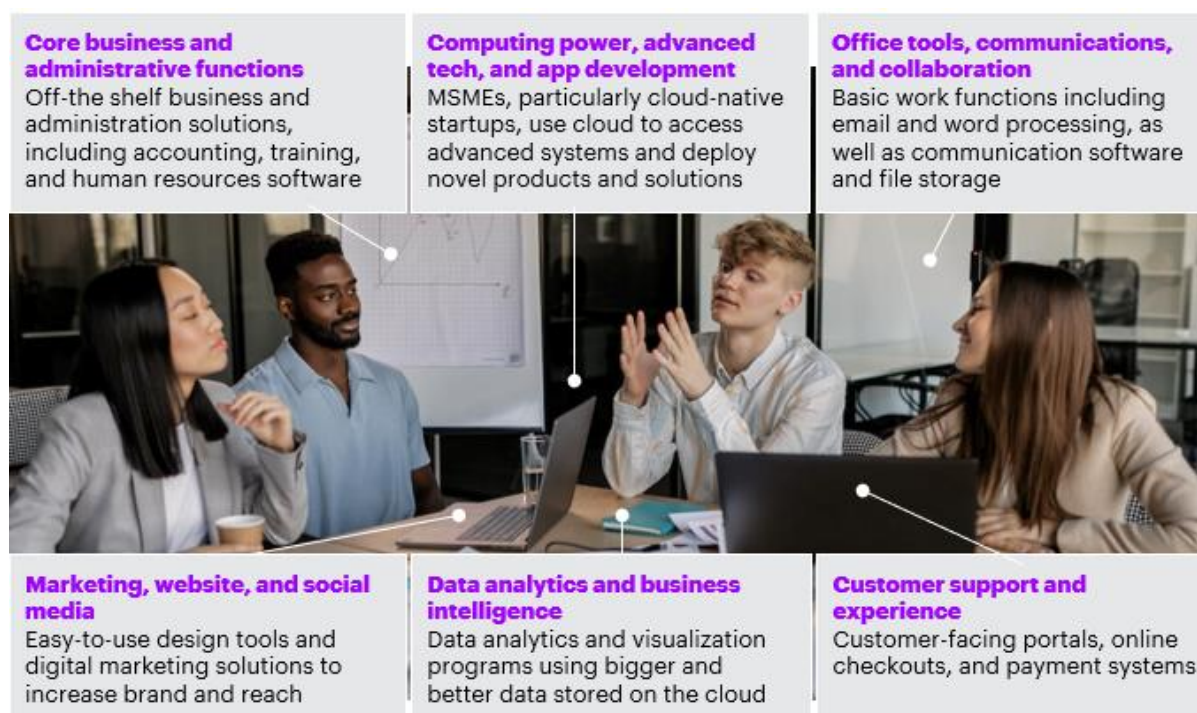
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[6] The definition of MSME used in this report is taken from the OECD ([2023](#)) and covers enterprises with businesses between 1-250 employees.
[7] AWS ([2023](#)), What is cloud computing?
[8] Accenture societal impact survey (2023), n = 562.

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 2. Having access to on-demand functionalities supports MSMEs to start, operate, and scale their business more efficiently and effectively.

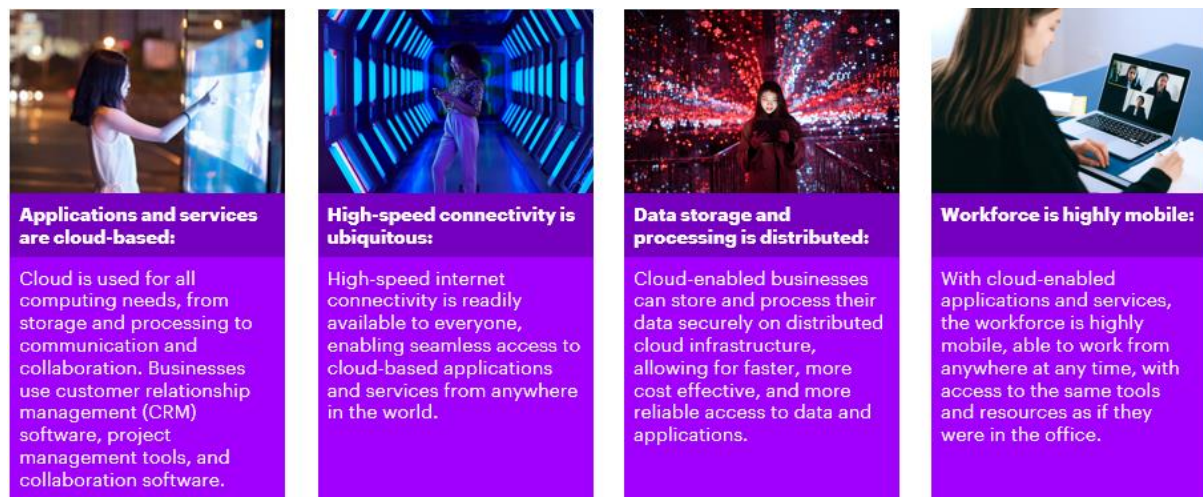**Figure 2: End-to-end cloud applications for MSMEs**

Core business and administrative functions
Off-the shelf business and administration solutions, including accounting, training, and human resources software

Computing power, advanced tech, and app development
MSMEs, particularly cloud-native startups, use cloud to access advanced systems and deploy novel products and solutions

Office tools, communications, and collaboration
Basic work functions including email and word processing, as well as communication software and file storage

Marketing, website, and social media
Easy-to-use design tools and digital marketing solutions to increase brand and reach

Data analytics and business intelligence
Data analytics and visualization programs using bigger and better data stored on the cloud

Customer support and experience
Customer-facing portals, online checkouts, and payment systems

Source: Accenture

1.2 Achieving a cloud-enabled economy can unlock significant societal and economic 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 characterized 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 3).

Figure 3: Characteristics of a cloud-enabled economy

Applications and services are cloud-based:	High-speed connectivity is ubiquitous:	Data storage and processing is distributed:	Workforce is highly mobile:
Cloud is used for all computing needs, from storage and processing to communication and collaboration. Businesses use customer relationship management (CRM) software, project management tools, and collaboration software.	High-speed internet connectivity is readily available to everyone, enabling seamless access to cloud-based applications and services from anywhere in the world.	Cloud-enabled businesses can store and process their data securely on distributed cloud infrastructure, allowing for faster, more cost effective, and more reliable access to data and applications.	With cloud-enabled applications and services, the workforce is highly mobile, able to work from anywhere at any time, with access to the same tools and resources as if they were in the office.

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 services[9] 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 specialized 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 specialized 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 specialized cloud applications and cutting-edge technologies tailored for expert tasks. This category encapsulates machine learning and AI platforms, big data analytics tools, internet of things (IoT) platforms, serverless computing, container management systems, and advanced security and compliance tools.

As the global economy increasingly digitizes, the need for MSMEs to increase their cloud maturity is becoming increasingly pertinent. MSMEs 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 artificial intelligence, see Section 1.2.2). For many MSMEs to maintain their competitive edge in a dynamic, cloud-enabled economy, the sophistication of

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[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

their adoption will need to evolve and adapt with the technology according to their specific needs.

Figure 4: Spectrum of cloud maturity and example applications
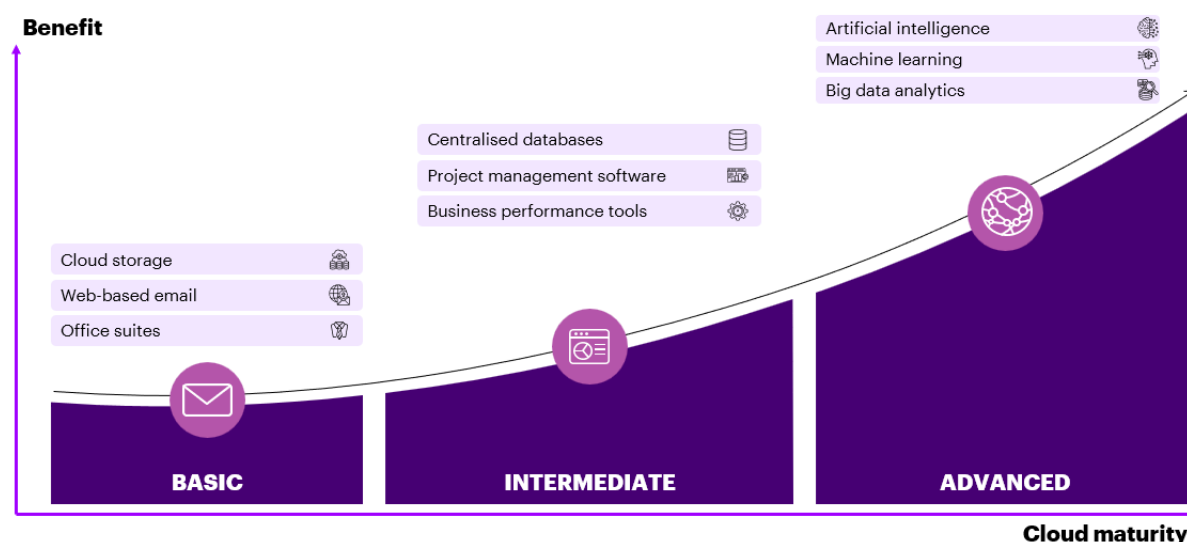
Note: Applications above are examples of types of uses for each of the levels of maturity. The lists are not exhaustive. Source: Accenture

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

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)
- quantum computing; and
- edge computing.

These examples form a growing list of advanced technologies that have become accessible to a wider base of users though cloud (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 expective to grow at an annual average rate of 27%.[12] Although the technology has only recently been adopted by the wider public, generative AI is already disrupting and enhancing businesses' processes, accelerating innovation, and facilitating greater speed and creativity across a variety of industries. Businesses and employees are already 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, 88% of Japanese MSMEs across several industries

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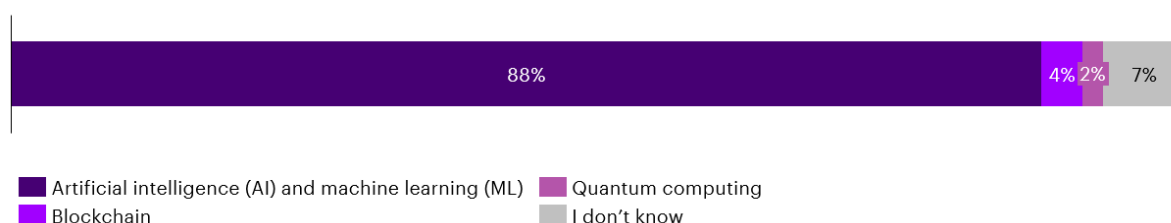[11] Damian Mazurek, (2023), Leveraging Cloud-based AI/ML Services to elevate your business.
[12] Precedence Research (2023), Generative AI Market size to hit USD 118 Bn by 2032
[13] AWS (2023), Generative AI on AWS.

identified AI (including generative AI and natural language processing (NLP)) and ML as the technologies likely to be most significant in creating societal impacts in 2030.[14,15] Generative AI could be used by cloud-enabled MSMEs for a wide variety of applications, such as helping medical professionals analyze patient data and testing results to inform decision making, or generating practice exam questions and content with instant feedback available to support individualized learning pathways.

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

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

■ Artificial intelligence (AI) and machine learning (ML)	■ Quantum computing	
■ Blockchain	■ I don't know	

Source: Accenture societal impact survey (2023), n = 49. 'Artificial intelligence (AI) and machine learning (ML)' includes subsets generative AI and natural language processing (NLP).

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 MSMEs new ways to produce and commercialize 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.[16]

While these industries are not the only ones that are impacted by cloud technology, these industries 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),
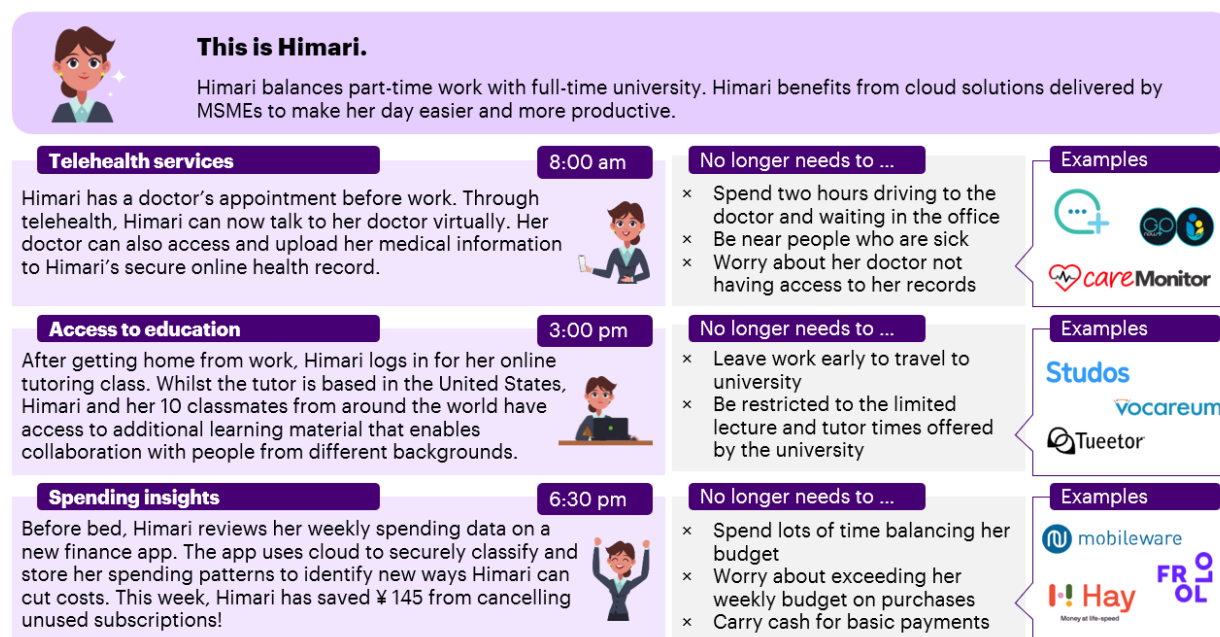
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[14] Accenture societal impact survey (2023), n = 49. 88% of Japanese MSMEs is consistent with the 78% of MSMEs globally out of a sample of 562 who identified AI and ML as the technologies likely to be most significant in creating societal impacts by 2030.
[15] Survey responses were from MSMEs working in healthcare, education, agriculture, finance, and sustainability.
[16] 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).

and economic prosperity and equality (Goal 9 and 10).[17] Figure 6 demonstrates through a stylized cameo how cloud technology supports access to these industries for individuals through digital transformation.

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

This is Himari.

Himari balances part-time work with full-time university. Himari benefits from cloud solutions delivered by MSMEs to make her day easier and more productive.

Telehealth services	8:00 am

Himari has a doctor's appointment before work. Through telehealth, Himari can now talk to her doctor virtually. Her doctor can also access and upload her medical information to Himari's secure online health record.

No longer needs to ...
× Spend two hours driving to the doctor and waiting in the office
× Be near people who are sick
× Worry about her doctor not having access to her records

Examples
careMonitor

Access to education	3:00 pm

After getting home from work, Himari logs in for her online tutoring class. Whilst the tutor is based in the United States, Himari and her 10 classmates from around the world have access to additional learning material that enables collaboration with people from different backgrounds.

No longer needs to ...
× Leave work early to travel to university
× Be restricted to the limited lecture and tutor times offered by the university

Examples
Studos
Vocareum
Tueetor

Spending insights	6:30 pm

Before bed, Himari reviews her weekly spending data on a new finance app. The app uses cloud to securely classify and store her spending patterns to identify new ways Himari can cut costs. This week, Himari has saved ¥ 145 from cancelling unused subscriptions!

No longer needs to ...
× Spend lots of time balancing her budget
× Worry about exceeding her weekly budget on purchases
× Carry cash for basic payments

Examples
mobileware
Hay *Money at life-speed*
FROOL

Notes: Examples include MSMEs and startups using cloud solutions from AWS case studies
Source: AWS[18]

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[17] United Nations (2023), Sustainable development goals.
[18] AWS (2023), Customer Success Stories.

2 Unlocking ¥1.9 in productivity benefits within key societal sectors

MSMEs are a major driver of economic performance in Japan, accounting for over 99% of all firms, 69% of the private sector labor force and around 50% of GDP.[19,20] Cloud technology is helping to create and scale MSMEs (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 1: 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 labor inputs). A full explanation of the modelling approach, data, and outputs can be found in Appendix A of the global report.

The OECD reports that the share of all businesses using at least basic forms of cloud technology in their business operations is at 68%, growing from 39% as recently as 2014.[21] Despite high levels of overall adoption, the OECD indicates more sophisticated rates of adoption are much lower with only 4% of Japanese businesses adopting AI.[22] The distribution of adoption across industries and verticals is also uneven, with Japan divided between younger, digitally-led industries such as gaming and entertainment, as well industries that have been slower to adopt, such as manufacturing, the public sector, and financial services.[23] The COVID-19 pandemic, however, acted as a catalyst spurring on digital disruption across the board, as much of Japan entered an extended lockdown, which tested the resilience of systems. In fact, the Ministry of Health, Labor and Welfare subsidized Japanese organizations affected by the pandemic to support them in transitioning to remote work.[24]

However, the range of new technologies underpinned by cloud is accelerating, with advances in technologies such as generative AI, that also offer significant economic and societal potential. Continued investment from Japanese industries and governments is required to continue realizing the benefits of the cloud-enabled economy. With cloud technology revenue growing at an compounding rate of around 15% each year, investment in the cloud will continue to rise, putting Japan in a good position to realize the benefits of a cloud-enabled economy.[25]

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[19] OECD (2022), Financing SMEs and Entrepreneurs 2022: An OECD Scoreboard.
[20] OECD (2023) value added by firm size
[21] Accenture analysis of OECD data. See global report for full methodology.
[22] OECD (2023)
[23] Boston Consulting Group (2019)
[24] Deloitte (2022)
[25] Statista (2023)

Annual productivity benefits unlocked by cloud-enabled MSMEs in key societal sectors are expected to reach ¥ 1.9 trillion by 2030

5.2 million people in Japan are expected to be employed by cloud-enabled MSMEs in key societal sectors by 2030

By 2030, the productivity benefits of the cloud-enabled economy to Japanese societal sectors would be significant. Through successful transition to a cloud-enabled economy, MSMEs in the healthcare, education, and agriculture industries within Japan are expected to unlock ¥ 1.9 trillion in combined annual productivity benefits by 2030, a 17% increase from ¥ 1.6 trillion currently.[26] Under this scenario of cloud adoption, it is estimated that 5.2 million people would work at cloud-enabled MSMEs in these industries, which would be 7% of the total jobs in Japan. This reflects the increasing use of cloud technology in almost all forms of digital technology and occupations across the economy. Under a cloud-enabled economy, the societal impacts in Japan created by cloud-enabled MSMEs are expected to be 17% greater than they are currently.

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[26] Methodology in Appendix A of the global report.

3 The societal impact of the cloud-enabled economy

MSMEs that harness cloud have the potential to create significant societal impact in Japan. 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 computing, MSMEs can enhance the efficiency, affordability, and accessibility of services in these industries, enabling advancements such as telemedicine, online education, precision agriculture, financial access and autonomy, and sustainable technology.[27] These solutions will lead to improved social wellbeing and development.

3.1 Driving innovation and improving access to healthcare and life sciences

With 30% of the population over age 65, Japan has a relatively older population compared to the rest of the world.[28,29] Along with the need for the healthcare system to adjust to an aging population, approximately 8% of population lives in rural areas, which imposes additional barriers to accessing healthcare.[30] Cloud technology is helping to overcome logistical and travel-related barriers to accessing healthcare by enabling MSMEs to make healthcare easier to access whilst also driving efficiency in healthcare delivery and supporting decisions around patient healthcare. Through virtual consultations and monitoring of health indicators, cloud technology can help make healthcare more accessible to underserved communities throughout Japan. If Japan were to achieve a cloud-enabled economy, MSMEs in healthcare are expected to unlock ¥ 1.2 trillion in annual productivity benefits by 2030. Cloud-enabled MSMEs are expected to support 60 million virtual health consultations per year by 2030.[31]

Impact of MSMEs on healthcare in the cloud-enabled economy, by 2030

¥ 1.2 trillion in annual productivity benefits unlocked through cloud-enabled MSMEs in the healthcare sector

60 million virtual consultations supported by cloud-enabled MSMEs

Note: Estimates for the number of telehealth 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.

Cloud technology is also important for streamlining administrative tasks, creating efficiency for healthcare providers. 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

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[27] Methodology in Appendix B and C of the global report
[28] World Bank (2022), Population ages 65 and above.
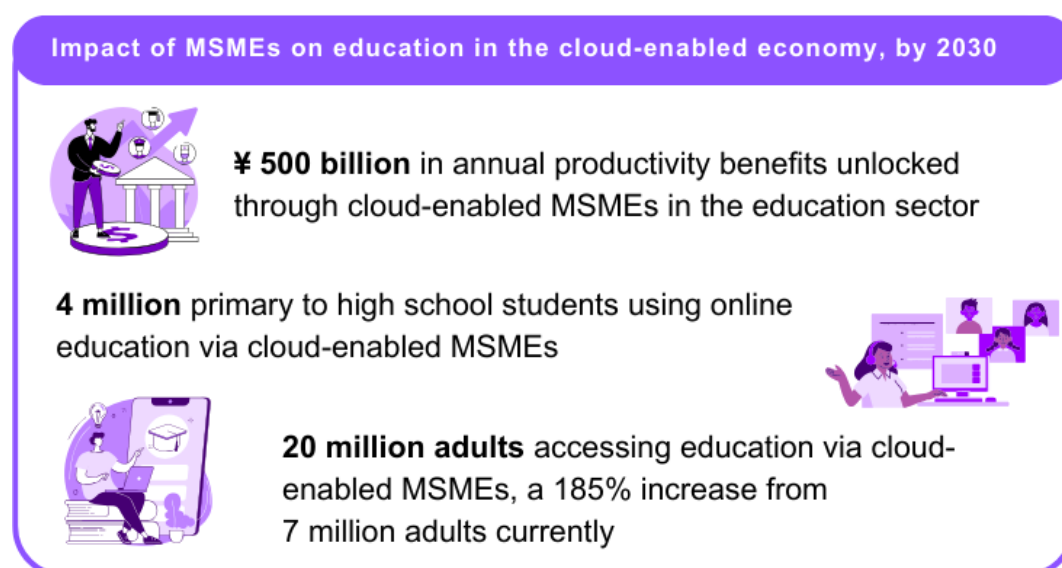[29] WHO (2022), Ageing and health.
[30] World Bank (2022), Rural population.
[31] Remote health consultations can also be supported by telephone or through large cloud-enabled firms.

personalized 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. While generative AI is still a nascent technology, MSMEs can use it to support clinical decision making, helping medical professionals analyze data more accurately, along with supporting efficiency in research and development.[32]

3.2 Improving access to engaging and personalized education

Japan has strong levels of educational attainment, with 65% of people aged 25-34 participating in tertiary education.[33] However, participation in adult training and learning opportunities beyond the formal education sector is relatively low in Japan compared to other countries.[34] Cloud technology can make education more equitable and accessible by providing new learning opportunities for a wider audience, including remote communities or adults with limited time who are looking to boost or diversify their skills. Under a cloud-enabled economy, MSMEs in education are expected to unlock ¥500 billion in annual productivity benefits by 2030. Through supporting the education industry, cloud-enabled MSMEs are expected to facilitate four million school students and 20 million adults in Japan to receive online learning by 2030.

Impact of MSMEs on education in the cloud-enabled economy, by 2030

¥500 billion in annual productivity benefits unlocked through cloud-enabled MSMEs in the education sector

4 million primary to high school students using online education via cloud-enabled MSMEs

20 million adults accessing education via cloud-enabled MSMEs, a 185% increase from 7 million 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.

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. Cloud technology can also help reduce the administration workload for teachers, and introduce advanced analytics into the classroom, helping to personalize learning. Atama plus is a Japanese MSME using cloud and AI to deliver personalized online education to students (see Case Study). AI, and in particular, generative AI could be particularly useful in helping educators provide differentiated learning pathways based on the needs of individual students.[35,36]

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[32] WE Forum (2023), How will generative AI impact healthcare?
[33] OECD (2022), Education at a Glance 2022: OECD Indicators.
[34] OECD (2021), Creating Responsive Adult Learning Opportunities in Japan.
[35] World Economic Forum (2023), Can AI improve education? Here are 4 potential use cases.
[36] Stanford University, (2023) AI Will Transform Teaching and Learning. Let's Get it Right.

Atama plus uses cloud-based, AI algorithms to deliver personalized learning pathways for students across Japan

atama+

Industry: Education

Size: Medium (250 employees)

Locations: Japan

Atama plus is a Japanese EdTech company founded in 2017 with the mission of "optimizing learning for each student," and "acquiring basic academic skills in the shortest possible time." The founders noticed that although many other aspects of our lives have embraced the power of technology, education is still predominantly using many-to-one, in-person teaching models and paper-based materials. These methods are susceptible to leaving behind certain students or, alternatively, students who want to advance faster. Research conducted by atama plus shows that 78% of junior high school students stumbled on a unit they learnt in the previous grade, and this percentage increases the older they are showing the cumulative impact of miscomprehension.

Currently atama plus operates within the cram school system – additional before- and after-school classes that primarily caters to students from elementary through high school and assists students with AI-enabled learning materials. **Atama plus is available in more than 3,500 cram schools across all 47 prefectures in Japan**, providing online courses to give user students in the most remote areas of Japan the same access to education.

"Atama plus's cloud-based AI learning app changes the way students engage with educational content. Our AI algorithm analyses a student's past performance, identifying critical weaknesses and develops a personalized curriculum to provide the most efficient learning path to master a given topic."

Junichi Tsukamoto, Chief Engineer, at atama plus

Cloud is the central infrastructure that powers atama plus to develop AI learning materials. Atama plus leverages computing resources and databases to run AI algorithms, which analyze a student's comprehension of a topic and create a personalized curriculum from over 500 million individual learning resources, to help students to practice the skills that are specifically lacking in a topic. An atama plus's survey of junior high school mathematics students shows that those using atama plus's AI teaching materials scored an average of **9 points higher than those that did not.**

During the COVID-19 pandemic, when people felt worried about face-to-face class at cram schools in Japan, online teaching methods became even more important to education resilience. Over the 2020 academic year, the number of **atama plus users increased five-fold** from the previous year, while the **number of active classrooms more than doubled**. Atama plus attributed the ability to "keep the lights on" during this period of high demand specifically to the scalability possible with cloud.

Source: Accenture consultations, Atama+ (2023), Atama+ (2023)

3.3 Developing smarter and more sustainable farming practices

Japan has had higher agricultural productivity growth between 2010 and 2019 than the global average, despite having only 12% of land available for agriculture and relatively small farm sizes compared to the world.[37] MSME cloud services are being used by the agricultural industry in Japan to support smarter, more sustainable farming practices. These technologies can assist agricultural decision making, by employing sophisticated monitoring devices that provide better, real-time data about crops, livestock health, and resource consumption (referred to as precision agriculture).[38] In addition to supporting the use of data or supply chain tools, cloud technology is also enabling automated vehicles and equipment which helps to improve the efficiency of agriculture. Under a cloud-enabled economy, MSMEs in agriculture are expected to unlock ¥100 billion in annual productivity benefits by 2030. Precision agriculture technology supported by cloud-enabled MSMEs are expected to be in operation in one in three farms across Japan by 2030.

Impact of MSMEs on agriculture in the cloud-enabled economy, by 2030

¥100 billion in annual productivity benefits unlocked through cloud-enabled MSMEs in the agriculture sector

1 in 3 farms using precision agriculture supported by cloud-enabled MSMEs, a 130% increase from 1 in 8 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.

3.4 Improving financial access and wellbeing

Digital transformation of the finance sector has led to wave of disruption, increased competition, and new types of products and services that better service customers.[39] 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 better access to information.[40] As such, cloud-native MSMEs in the finance industry (referred to as fintechs) represent one of the fastest growing markets in the world, expected to rise from ¥18 trillion in 2022 to ¥77 trillion globally by 2030 – more than a 400% increase.[41]

The rise of fintech apps has not only been 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

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[37] OECD (2022), Agricultural Policy Monitoring and Evaluation 2022: Reforming Agricultural Policies for Climate Change Mitigation.
[38] FAO (2022), Leveraging automation and digitalization for precision agriculture: Evidence from the case studies.
[39] OECD (2020), "Digital disruption in banking and its impact on competition".
[40] Ibid.
[41] Vantage market research (2023)

Accenture societal impact survey, by 2030, one in four people globally are expected to be using financial services supported specifically by cloud-enabled MSMEs.[42] Globally, 15% of cloud-enabled MSMEs working with the finance sector are expected to be helping budget-constrained customers or small businesses to better manage their finances.[43,44] 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.[45] While this technology is still nascent, the possibility of integrating AI to monitor and screen for better fees or financial products holds enormous potential to improve financial health.[46]
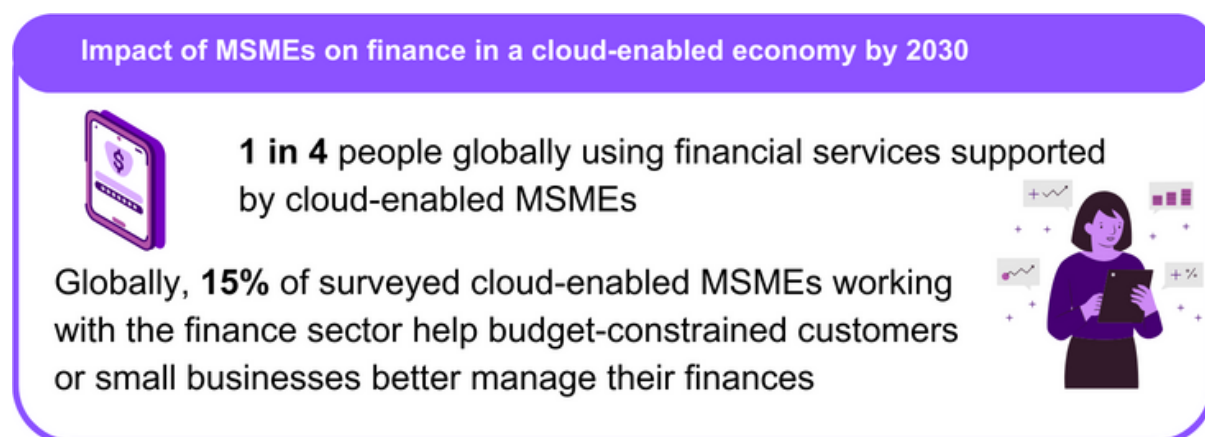
Source: Accenture societal impact survey (2023), n = 188. Based on global results across 12 countries.

For many countries, a cloud-enabled financial services sector is not far away, with many MSMEs 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.[47] A sample of MSMEs operating in the financial services space globally indicated that the most common areas for these MSMEs to be active were in providing digital banking and budgeting or financial management tools.[48,49] The improvements in societal outcomes most often attributed to these MSMEs were increased affordability of services, improved financial literacy and education, and fraud detection.[50,51]

3.5 Designing a sustainable future

Developing the tools and technologies that will support a sustainable future is one of the most pressing global challenges, but also one filled with enormous economic potential. Cloud-enabled MSMEs can employ technology and digital transformation to directly reduce environmental impact through 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 MSMEs to directly address their climate and sustainability objectives, such as through energy or

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[42] Accenture societal impact survey (2023), n = 188.
[43] Accenture societal impact survey (2023), n = 188.
[44] Based on the number of cloud-enabled MSMEs currently supporting this outcome.
[45] Crunchbase (2023) How the future of personal finance is self-driving money
[46] Crunchbase (2023) How the future of personal finance is self-driving money
[47] IMF (2021), Powering the Digital Economy: Opportunities and Risks of Artificial Intelligence in Finance.
[48] Accenture societal impact survey (2023), n = 188.
[49] Based on the services that cloud-enabled MSMEs are currently delivering.
[50] Accenture societal impact survey (2023), n = 188.
[51] Based on the number of cloud-enabled MSMEs currently supporting this outcome.

emissions monitoring and reduction.[52] 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 MSMEs to achieve a range of sustainable outcomes.[53,54] Globally, 15% of cloud-enabled MSMEs providing services to achieve sustainability goals are expected to be supporting "smart cities", such as through optimising traffic flows or making waste removal more efficient, and enabling the tracking or reduction of electricity usage.[55,56,57,58]

Impact of MSMEs on sustainability in a cloud-enabled economy by 2030

1 in 5 businesses globally using sustainability services supported by cloud-enabled MSMEs

Globally, **15%** of surveyed cloud-enabled MSMEs that provide sustainability services support smart cities
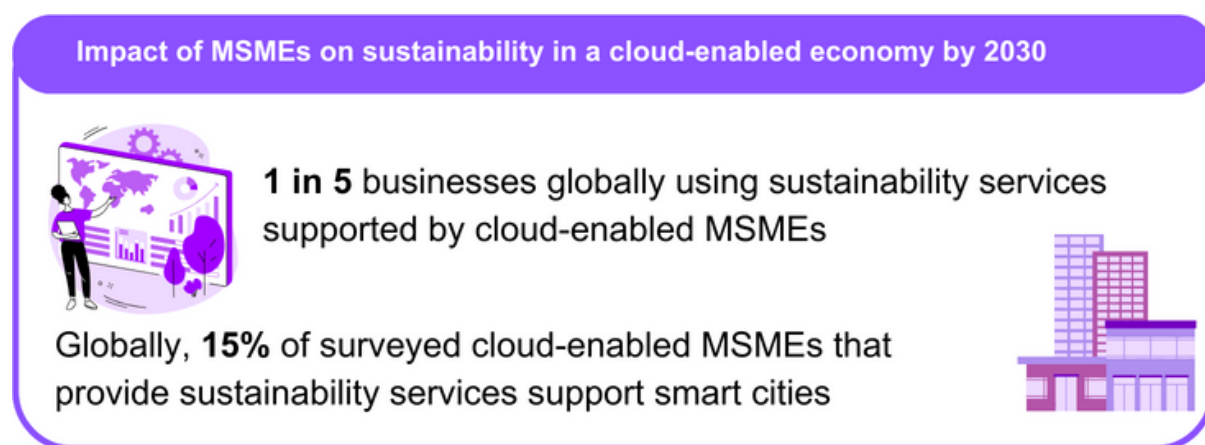
Source: Accenture societal impact survey (2023), n = 66. Based on global results across 12 countries.

According to the Accenture societal impact survey of global MSMEs, 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.[59] Through these sustainable solutions, global MSMEs 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.[60]

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[52] Accenture societal impact survey (2023), n = 66.
[53] IDC (2023), Smart Cities.
[54] IDC (2021), The Next Frontier: AI and Digital Twins in Smart Cities.
[55] Accenture societal impact survey (2023), n = 66.
[56] Based on the number of cloud-enabled MSMEs currently supporting this outcome.
[57] AWS (2023), Building Smart Cities with AWS Cloud.
[58] OECD (2021), Measuring smart city performance in COVID-19 times: Lessons from Korea and OECD countries.
[59] Accenture societal impact survey (2023), n = 66.
[60] Accenture societal impact survey (2023), n = 66.

4 Achieving the cloud-enabled economy

With businesses across Japan at starkly different points along the adoption spectrum, Japan'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 Japan, continue to concern cybersecurity, reluctant organizational cultures, insufficient infrastructure (e.g., software or hardware) or difficulty transitioning, and digital cloud skills (see Figure 7). Unlocking these opportunities in Japan by 2030 requires continued coordinated action from businesses, wider industry stakeholders and state, local, and federal governments to address the barriers to cloud technology uptake.

Figure 7: Primary barriers to cloud update

% of respondents listing barrier in top three responses
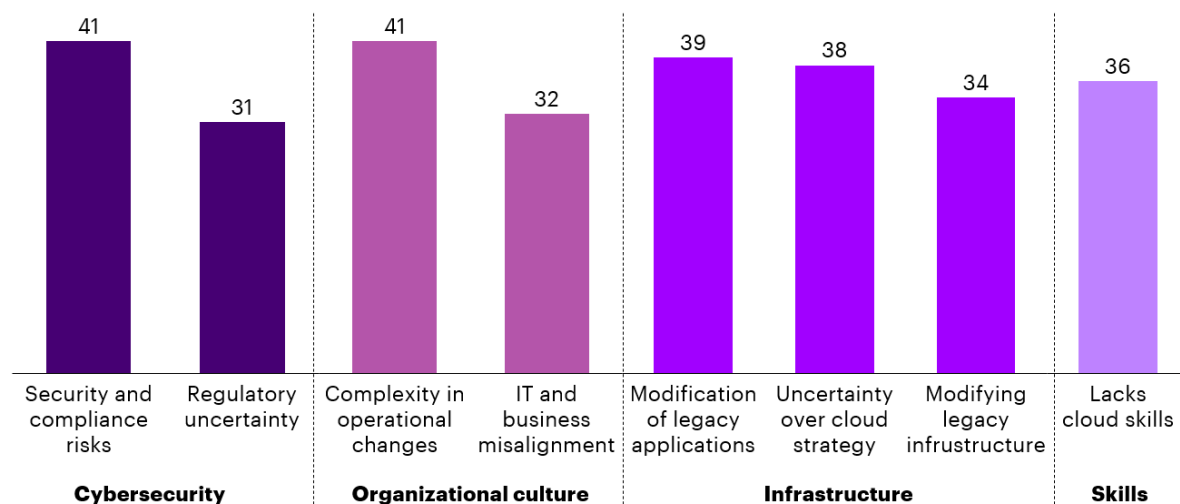
Source: Accenture (2023). Survey responses from 2022, n = 800.

To address each of these complex challenges MSMEs should evaluate barriers at the firm level, to identify specific security, IT resources, organizational culture, and skills required to be successful. This will help MSMEs to develop holistic cloud solutions, optimized and scaled to improve performance, and reduce costs.

4.1 Holistic strategies to overcome firm-specific barriers to cloud adoption

MSMEs can adopt a range of internal policies and actions to further integrate more complex cloud technology solutions across all business functions, thereby maximizing their productivity dividend overtime (see Figure 8).

Figure 8: Steps for MSMEs to accelerate cloud adoption and maturity

Legend: ■ Cybersecurity ■ Infrastructure ■ Skills ■ Organizational culture

Steps	Description	Cybersecurity	Infrastructure	Skills	Organizational culture
1 Identify how cloud can streamline strategic goals	• Identify how cloud solutions can meet your goals • Identify a cloud partner that can help navigate the process • Examine case studies of how MSMEs 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 optimized at the firm level				✓
2 Evaluate industry and government support	• Examine the Japanese 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 Japanese government, or sponsorship programs for startups run by cloud providers such as AWS	✓	✓	✓	✓
3 Educate all employees	• Support employees to upskill in cloud, and utilize training from cloud providers where relevant • Identify specific skill shortages to focus their training	✓		✓	✓
4 Review data security arrangements	• 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 harmonize policy across the business, with clear guidelines for different functional applications of cloud	✓			
5 Create a whole-of-business cloud migration strategy	• Evaluate the costs and benefits of alternative strategies to determine a whole-of-business solution that meets business goals • MSMEs should prioritize solutions which deliver the greatest net benefit in the medium to long term • Determine the scale and complexity of the cloud infrastructure required • MSMEs with less cloud experience could consider enlisting cloud partners such as consultants to achieve this	✓	✓	✓	✓

Source: Accenture

4.2 Strong policy support to address structural barriers and incentivize MSME cloud adoption

Japan's high rates of cloud adoption are partly attributable to strong policy support at all levels of government. This has included a variety of policies addressing the barriers discussed above in 4.1. Notably, Japan has one of the highest concentrations of optic fiber broadband connections among OECD countries, with the ambition to connect 99.9% to optic fiber by 2028.[61] The Japanese Government has also created clear guidelines for the application of cloud technology to privacy laws for highly regulated sectors such as healthcare and financial services.[62] This has encouraged confidence in cloud technology, increasing adoption in those sectors. However, there is an opportunity to further support cloud technology training programs for MSMEs, mainly by promoting awareness of the training options.[63] To continue improving policy and accelerate more MSMEs towards cloud maturity, international examples can offer best practice solutions for addressing further addressing barriers to cloud adoption (see Figure 9).

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[61] Japan Times (2022), Japan to bring fiber-optic networks to 99.9% of households by 2028
[62] Delphix (2020), The Japan Act on the Protection of Personal Information Explained
[63] AlphaBeta (2021), Unlocking APAC's Digital Potential: Changing Digital Skills Needs and Policy Approaches

Figure 9: Global best-practice examples of cloud adoption policies

Legend: ■ Cybersecurity ■ Infrastructure ■ Skills ■ Organizational culture

Policy	Key existing support	Future policy	International policy examples	Barriers addressed: Cybersecurity	Infrastructure	Skills	Organizational culture
Invest in digital infrastructure	An estimated 84% of broadband subscriptions are optic fiber in Japan. Japan also has the 9th most number of data centers globally of about 207 in 2022.	Continued investment into data centers and optic fiber connections, especially in regional and rural areas, would improve speeds to facilitate cloud.	**Singapore optic fiber** accounts for 93% of broadband connections **Thailand optic fiber** accounts for 94% of broadband connections		✓		
Invest in cloud skills and training	The Japanese Government has collaborated with industry and experts to increase cloud training for businesses, and supported other initiatives such as computer programming a mandatory subject in elementary school.	Continued collaboration with industry to deliver more cloud training, especially for MSMEs. Increase awareness of training options, as lack of training was identified as a major barrier in Japan.	**Australia's National Cloud Computing Strategy** includes cooperation with industry and educators to enhance cloud training **Brazil's Digital Transformation Strategy (E-Digital)** includes partnerships with industry and educators to provide cloud training and certifications	✓		✓	✓
Harmonize data privacy policy across regions	Amendments to the Act on the Protection of Personal Information (APPI) in 2019 prompted Japan the first country to earn an adequacy decision from the EU, enabling cross-border data flows.	Harmonize and update policy in line with global best practice to promote confidence in cloud, particularly as it relates to cross border flows.	**European Union's General Data Protection Regulation (GDPR, 2016)** improved clarity and consistency across the EU, promoting data flow within the EU	✓			
Incentivize cloud adoption and maturity	Japan offers several tax incentives and subsidies, including an IT Adoption Subsidy to businesses investing in cloud services in 2017, and a Workstyle Reform Promotion subsidy in 2020 to help businesses transition to remote work. This includes support for MSMEs to cover cloud-related costs.	Continued ongoing support for MSMEs to reduce the cost of transitioning to cloud and encourage innovation.	**United States' incentives** include cloud being fully tax deductible and tax credits for cloud-related investments		✓	✓	✓
Improve cloud-first policies	Within the 2021 Cloud Adoption Policy, the Japanese Government adheres to a "Cloud-by-Default Principle", requiring agencies to consider cloud first for IT systems. Japan is also building a shared cloud system for multi-levels of government (Gov-Cloud) and aims to transition data by the end of FY2025.	Consider public cloud-first policies and how more complex technologies dependent on cloud could be integrated into government functions.	**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	✓	✓	✓	✓

Source: OECD,[64] Statista,[65] Lim, S.,[66] Statista,[67] Deloitte,[68] AlphaBeta,[69] Australian Government,[70] Federal Government of Brazil,[71] Coos, A.,[72] GDPR EU,[73] Mcguire Sponsel,[74] UK Government[75]

[64] OECD (2023), OECD broadband statistics update
[65] Statista (2022), Number of data centers worldwide in 2022, by country
[66] Lim, S. (2019), The city of the future: What will a full-fiber broadband city look like
[67] Statista (2021), Share of fiber optic internet connection in Thailand from the 3rd quarter of 2019 to the 2nd quarter of 2021
[68] Deloitte (2022), Growing on the cloud
[69] AlphaBeta (2021), Unlocking APAC's Digital Potential: Changing Digital Skills Needs and Policy Approaches
[70] Australian Government (2013), The National Cloud Computing Strategy
[71] Federal Government of Brazil (2018), Brazilian Digital Transformation Strategy
[72] Coos, A. (2022), Data Protection in Japan: All You Need to Know about APPI
[73] GDPR EU (n.d.), What is GDPR, the EU's new data protection law
[74] Mcguire Sponsel (2020), Calculating cloud computing expenses
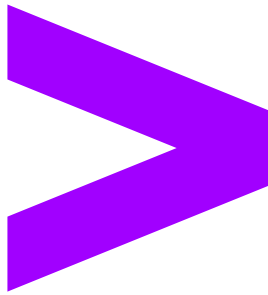[75] UK Government (2022), Government Cloud First policy

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