QUARTZ MEMBERSHIP

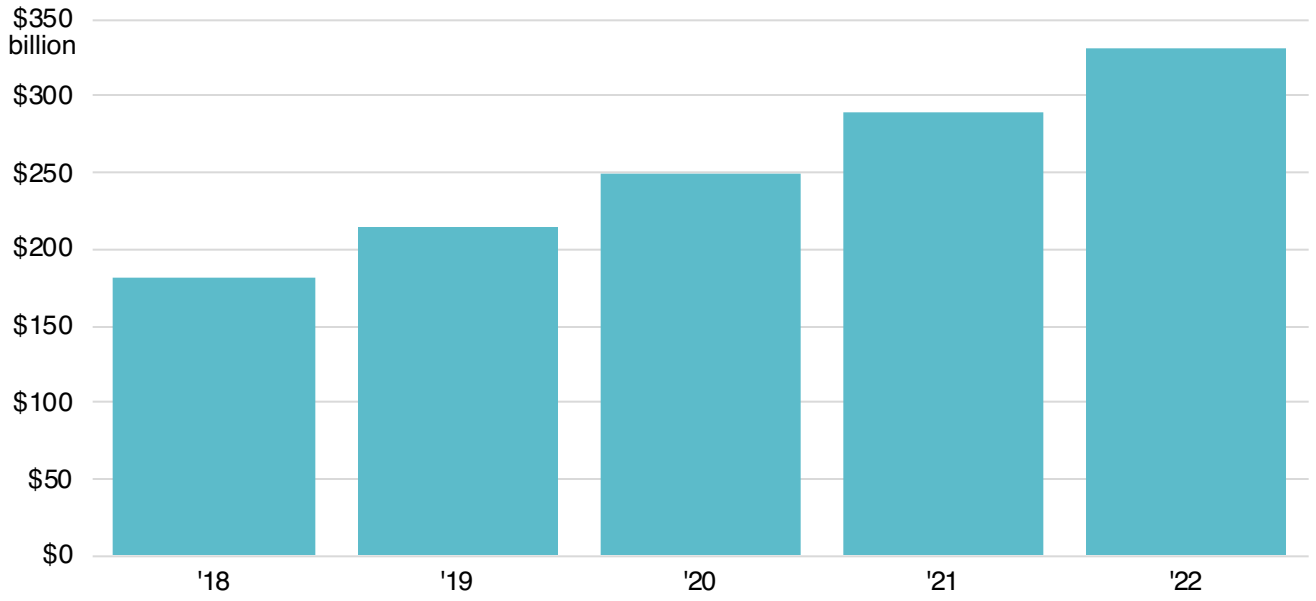
How cloud computing will power innovation in 2020

Member exclusive by  Dasia Moore

The cloud is everywhere

Cloud computing is so commonplace that most of us don't even think about it much. But a great deal of technology–both mundane and groundbreaking—depends on the cloud. Streaming music, developing artificial intelligence, and connecting Internet-of-Things devices all depend on the cloud. Ubiquitous cloud use has created a $200 billion cloud services industry, and analysts expect it to grow even more in the 2020s.

Worldwide cloud services revenue
Projected market size and growth



How it works

Cloud computing allows companies to outsource significant amounts of their IT work, accessing data and applications on-demand over the internet.

By far the most common arrangement is called “public cloud,” where a third party like Amazon manages IT infrastructure that is shared among its clients. The public cloud lets clients quickly scale their access to computing up or down depending on their needs without managing infrastructure themselves.

“Private cloud” arrangements, by contrast, don’t share resources between clients. Sometimes third parties like Amazon host these private clouds. Other times, organizations host a private cloud themselves. Although in these cases they aren’t outsourcing their IT, they still rely on the technology behind cloud computing: the ability to scale “horizontally” by balancing computing across more machines.

The three levels of cloud computing

Cloud providers can offer services at three levels: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS). At the most basic level, IaaS, the provider manages physical infrastructure and networking. On the other end of the spectrum, a client can pay for SaaS services that deliver an application to end users using the cloud. Many providers operate at all three levels.

IaaS providers offer the basic infrastructure of cloud computing: servers with storage space and network connectivity. IaaS accounts for the largest share of the cloud services market.

PaaS combines cloud infrastructure with platforms that help developers build applications on the cloud. It's essentially the middle layer that helps cloud clients maximize their cloud use and capabilities.

SaaS is the business of creating and selling what most of us, as end users, see as the cloud: the applications and interfaces that allow us to interact seamlessly with data stored on the cloud.

How it makes innovation possible

Cloud makes possible the file-sharing, remote access, and real-time collaboration that have become so central to our use of the internet. Many of the most anticipated tech innovations depend on cloud computing—leading the Wall Street Journal to call cloud one of “tech’s unsung heroes.” Here are a few innovations brought to you by the cloud:

- In China, cloud computing is transforming urban traffic. Alibaba’s AliCloud created a **traffic-management system** to analyze traffic patterns, detect incidents in real time, and automate emergency dispatches. Initial tests in Hangzhou increased traffic speed by 15% in Hangzhou.

- Many of today's **analytics tools and practices** wouldn't be possible without cloud infrastructure to host massive quantities of data.

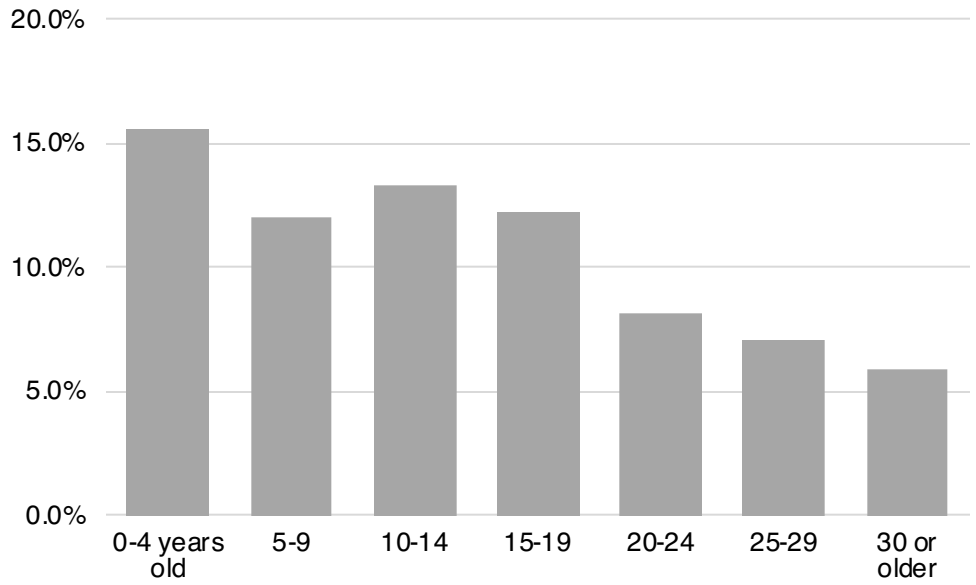
- The **next generation of software development** is being made possible by the cloud, as coders and IT personnel spend less time worrying about the limitations of internal servers and more time pushing the boundaries of software capability.

- **Cloud gaming** is transforming the gaming industry. Unlike games that players download and install or load from cartridges, games stored and streamed on the cloud can be played on any console with internet connectivity.

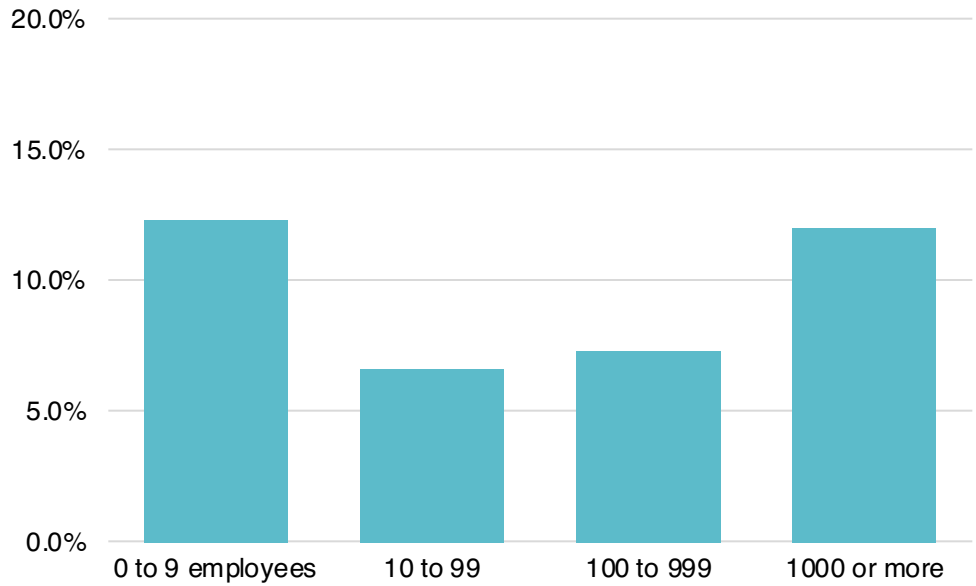
How it democratizes computing

Outsourcing IT helps businesses save on the time and money required to do complex computing and large-scale data storage. This can benefit any business, but it's especially important for small businesses and startups that cannot afford to build out IT teams and infrastructure as they scale. In fact, an analysis of survey data by economists, reported in Harvard Business Review, showed that smaller firms were most likely to adopt cloud tech.

Younger firms are more likely to adopt cloud computing
Based on 2016 data



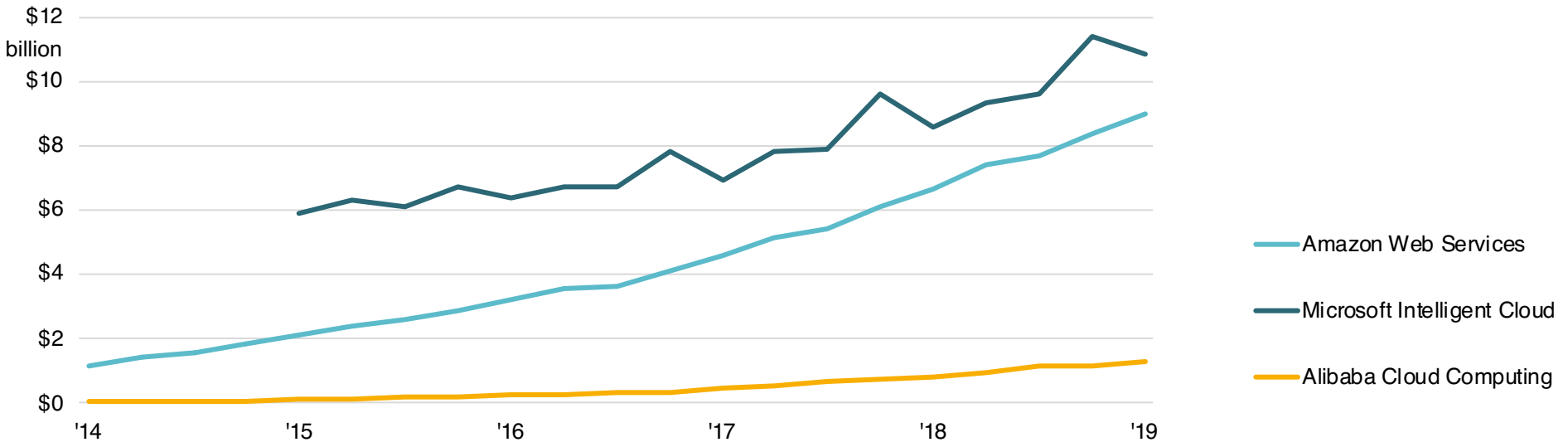
Small and large firms are more likely to adopt cloud computing
Based on 2016 data



Cloud services are big business

In 2018, public cloud services brought in $32 billion. Five Big Tech firms dominate IaaS in particular: Amazon, Microsoft, Alibaba, Google, and IBM. Together, they account for more than three-quarters of the IaaS market. Amazon's cloud division, Amazon Web Services (AWS), claims 47.8% alone. In 2018, AWS brought in more revenue than several of the world's leading corporations, including McDonald's and Qualcomm. AWS does not lead by every metric. Unlike the other four providers, Amazon does not compete in SaaS, and Microsoft's total cloud services revenue is consistently higher than its competitors'.

Quarterly cloud revenue for top three public cloud providers
For quarters reported by Amazon, Microsoft, and Alibaba



The cloud is a place on earth

The cloud is more than just a concept. It requires massive data centers around the world filled with servers powered around the clock. This is one reason the big providers have an advantage over smaller competitors: they have the resources and economies of scale required to build and own the physical cloud.

Amazon Web Services global infrastructure
Map via AWS website

Covering a region can require millions of square miles—and billions of dollars. Project Osmium, the largest of a cluster of data centers Microsoft is currently building, will be 1.7 million square feet when it opens in 2022. The total cluster will cost Microsoft $3.5 billion to build.

> The first wave of cloud adoption is over—the time when folks were experimental in their adoption of cloud... [Cloud] has become mainstream, and [businesses] are really considering cloud as the core underpinning of their business, technology, and IT strategy.

Sid Nag, research vice president, Gartner

The future of the cloud

Cloud computing is already mainstream. Now, it's becoming more sophisticated. As businesses better understand the cloud, their demands are shifting, and cloud providers are innovating to keep up with expectations.

- **Cloud clients are restructuring to maximize their use of cloud technology.** In the first phase of cloud computing, businesses outsourced infrastructure, storage, and analysis. Now even more services—including software and systems services—are shifting away from internal IT and towards cloud providers.

- **Providers are offering increasingly tailored cloud experiences.** Hybrid, serverless, distributed, and multi-cloud solutions are all on the rise. To help businesses manage their individualized cloud systems, new players are offering services like cloud brokerage.

- **Governance is more important than ever.** As more companies move their data to cloud storage, many are increasingly concerned with compliance, and regulators are raising the bar for data privacy around the world.

> The cloud-managed service landscape is becoming increasingly sophisticated and competitive. In fact, by 2022, up to 60% of organizations will use an external service provider's cloud-managed service offering, which is double the percentage of organizations from 2018.

Sid Nag, research vice president, Gartner

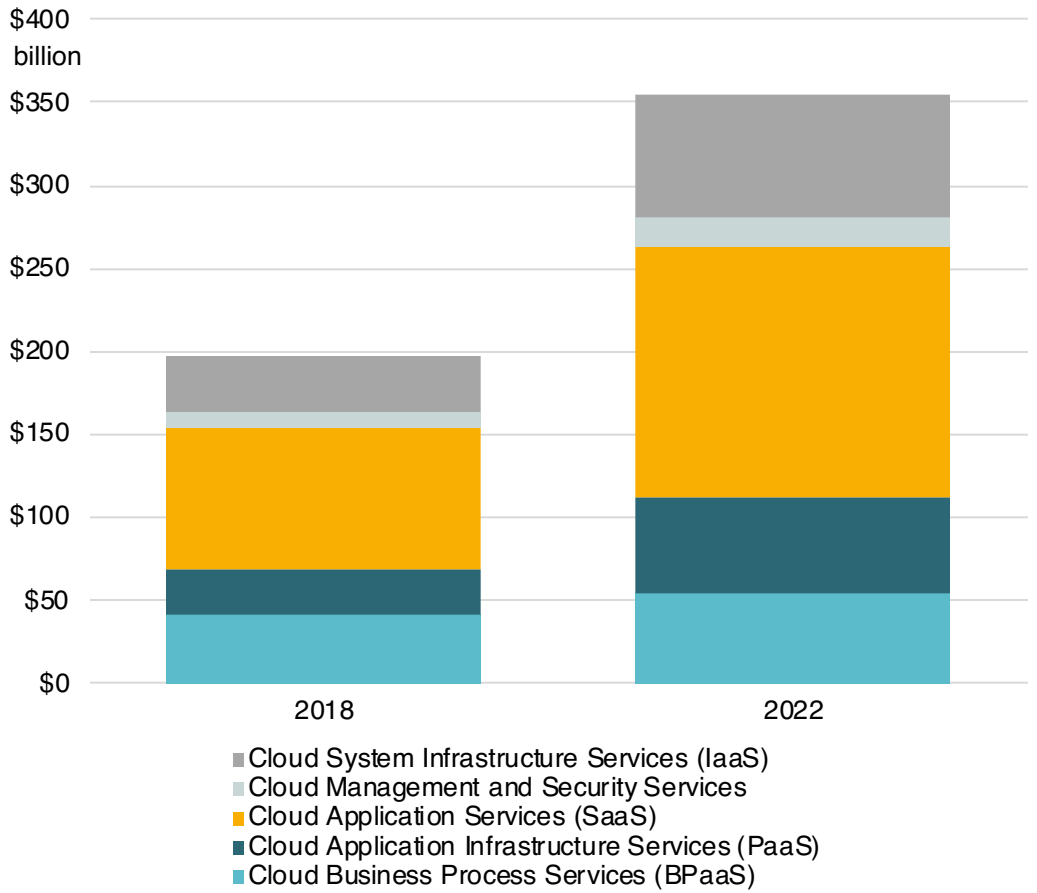
Cloud implementation is getting more sophisticated

Businesses' spending is shifting towards cloud-native and cloud-enhanced software and systems. Gartner forecasts that platform-as-a-service and system infrastructure services revenue will grow by more than 120% from 2018-2022, versus 80% growth overall.

Providers are responding to their clients' maturing expectations with increasingly tailored offerings. Hybrid options like Google Anthos, Microsoft Stack, and AWS Outposts—which allow companies to integrate their private cloud systems with public cloud—have gained traction. Other emerging cloud technologies including distributed cloud and serverless cloud are also gaining traction.

Third-party cloud brokers have arisen to help companies manage their increasingly complex customization and integration needs.

Worldwide public cloud revenue by service type
Projections for 2018 versus 2022



And data privacy is, too

Data privacy and ethics are key concerns as cloud adoption accelerates. Businesses see governance as a priority as they move more and more of their data to cloud servers. Cloud providers like Amazon boast of the high-tech security they use at their data centers. Still, regulators are increasing their scrutiny of cloud-stored data. Legislation like the European Union's General Data Protection Regulation (GDPR)—which requires that European citizens' data be stored in the EU or a similarly-regulated jurisdiction–directly impacts the model of cloud computing and is likely to become more common in the coming decade.

2018

GDPR goes into effect. One requirement is that EU citizens' data be physically stored in the EU or a similarly-regulated jurisdiction.

2019

The Asia Cloud Computing Association—an industry group—pushes back against data localization rules, saying they hurt security instead of helping.

2020

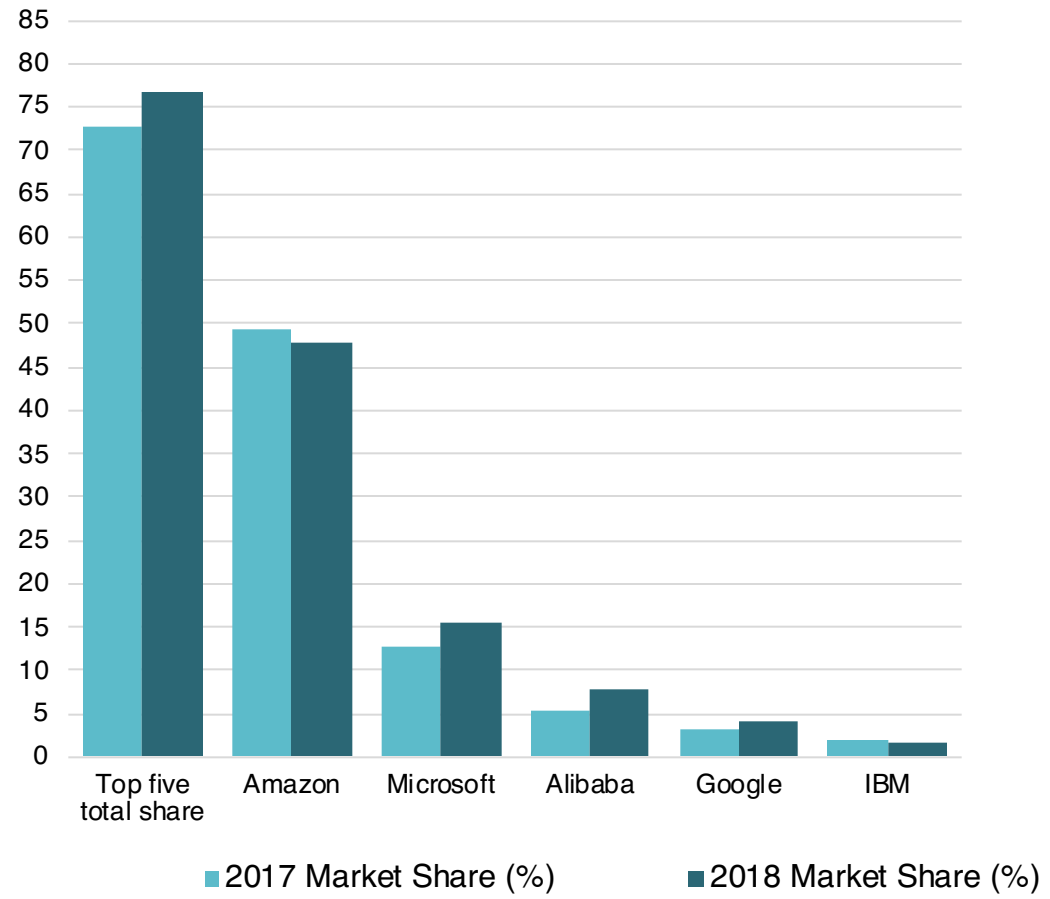
The California Consumer Privacy Act goes into effect. It establishes the protection of personally identifiable information as a right that companies must defend.

Can the big players be disrupted?

As cloud services become more complex, it is becoming less likely that upstarts will have the opportunity to challenge the big five public cloud providers. The leaders' combined market share has actually increased since 2017. And as Gartner's Sid Nag told Quartz, "Innovation is going to be for those that have deep pockets…The bigger players, the bigger cloud providers that are dominating the market will be reinvesting their revenues and profits back into the business."

There is still a possibility that control of the cloud will shift within the top five players. Amazon's market share has declined, and its 26.8% growth in revenue from 2017-2018 is dwarfed by growth rates at Microsoft, Alibaba, and Google—60.9%, 92.6%, and 60.2%, respectively.

Market share for top IaaS public cloud providers, 2017 and 2018



Want to know more? Read Quartz coverage of cloud services.

- Early cloud computing was like borrowing a book from the library — For the (fairly long) history of cloud computing.
- Amazon's cloud dominance is starting to slip — If you're curious about whether Amazon will continue to dominate.
- Microsoft is coming for Amazon's cloud crown — For the background on how Microsoft rose to challenge Amazon.
- Inside Google Cloud Next, the conference for the search giant's next big business — If you want an inside look at the innovation—and fan devotion—powering Google's cloud business.
- South Africa is now a major hub for big tech's cloud datacenters — If you're interested in what the cloud wars look like on the ground.

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