Cloud Computing: Digital Utility with AI Growth Tailwinds

Shuying Huang, Business Analyst, Nasdaq Index Research & Development
Mark Marex, Senior Director, Nasdaq Index Research

What are the current trends in Cloud Computing?

Cloud computing has greatly accelerated over the past decade, both in terms of its adoption rates across various end-users, and in its growing capabilities to provide efficient solutions for raw computing capacity, storage, application deployment, and overall IT infrastructure management. Cloud computing has become an essential cornerstone especially across enterprise customers, with 94% of enterprises worldwide utilizing it, to some extent, in their operations. Some recent trends in cloud computing include[1]:

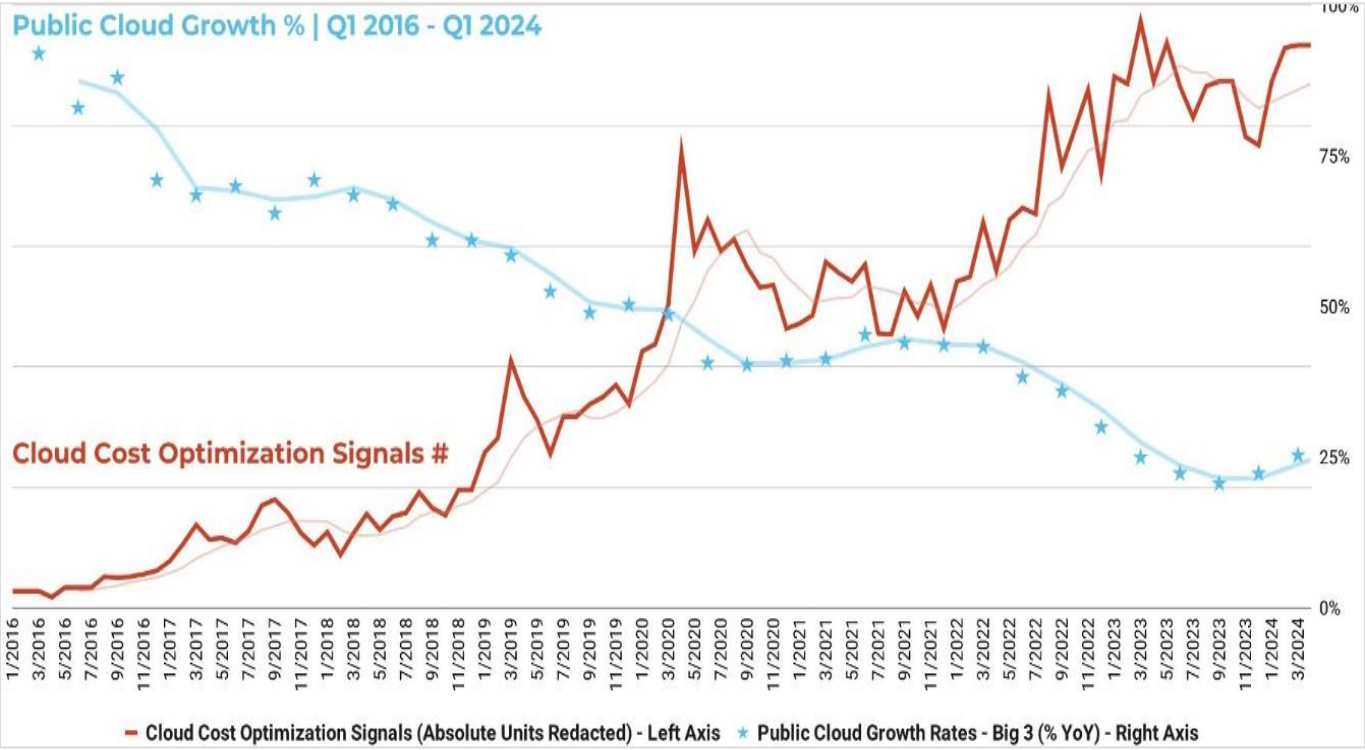
- Cloud Optimization: With an astonishing 85% of large organizations (per Forbes) projected to adopt hybrid cloud models by 2024—up from 76% last year—cloud optimization is at the forefront of technological adaptation. Real-time infrastructure spend tools are enabling companies to fine-tune their cloud usage, providing immediate adjustments that help manage and optimize costs more effectively.[2]
- AI-as-a-Service: Infrastructure solutions have become the cornerstone of AI innovation. Infrastructure-as-a-Service (IaaS) provides businesses with the opportunity to access advanced AI tools previously confined to firms with the internal capability to create AI resources. These resources will facilitate task automation, enhance data analysis, improve user experiences, and help develop new business models, making AI more accessible and impactful.[3] The AI-as-a-Service Market is set to reach $168.2 billion by 2032, growing at a CAGR of 39.6% from 2023 to 2032.[4]
- Cloud Sustainability: According to Lanchester University, 1.5% or 100 million tons of all greenhouse gas emissions globally are generated by cloud computing.[5] The commitment made by major cloud service providers, Google, Microsoft and Amazon, to achieve net-zero emissions sets a new standard in sustainability. This push toward greener cloud solutions is driving significant transformation within the industry. In an attempt to reduce their carbon footprints, cloud providers are inspiring the development of more sustainable technologies that will preserve the environment.[6]
- Serverless Computing: Serverless computing is a model of delivering backend services on a per-usage basis. While on-premise servers remain in use, companies procuring backend services from a serverless provider are billed according to their actual consumption rather than a predetermined bandwidth or server count. It is becoming a preferred model for organizations looking to offload server management

[1] https://www.zippia.com/advice/cloud-adoption-statistics/
[2] https://www.forbes.com/sites/bernardmarr/2023/10/09/the-10-biggest-cloud-computing-trends-in-2024-everyone-must-be-ready-for-now/
[3] https://www.nutanix.com/solutions/ai
[4] https://market.us/report/artificial-intelligence-ai-as-a-service-market/
[5] https://www.lse.ac.uk/granthaminstitute/news/we-need-to-include-digital-sustainability-in-climate-action/
[6] https://www.gartner.com/en/newsroom/press-releases/2022-04-21-gartner-says-three-emerging-environmental-sustainability-technologies-will-see-early-mainstream-adoption-by-2025

responsibilities. Additionally, this approach supports pay-as-you-go strategies, facilitating better cloud resource utilization and cost management.[7]

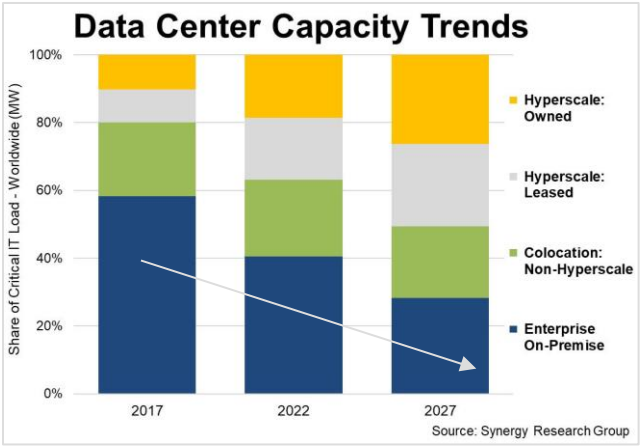
- Citizen Development: The rise of no-code and low-code solutions is empowering non-technical users to take more control over cloud applications. Open-source and hyperscale toolkits are enabling leaders and enterprises without coding expertise to effectively manage and optimize their cloud environments.[8]

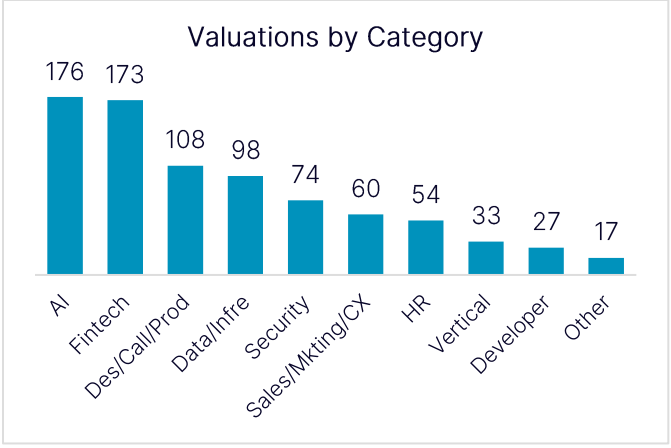
What is Driving Growth in Cloud Computing?



Cost is typically one of the biggest reasons that organizations are switching from on-premises infrastructure to cloud deployments, reflecting the broader industry movement toward flexible and cost-effective cloud solutions that offer both enhanced scalability and efficiency. Despite that longer term trend, public cloud spending growth definitely slowed down in 2022-2023 amid historically high inflation and fears of recession; along with weakness in other areas of IT spending, cloud cost optimization became top of mind for many users. As corporate budgets recover, perhaps bolstered by recent Fed rate cuts, companies are likely to shift their focus from cost-cutting measures to new initiatives once again. This could help drive a reacceleration in the transition from traditional IT systems to cloud-based infrastructure, which appears likely given the upswing in the data shown in the above chart. According to Synergy Research Group's chart below, hyperscale operators will account for over half of all capacity in five years, while on-premises will drop to under 30%,[9][10] indicating that the primary revenue driver—modernizing infrastructure—still has significant growth potential over the next few years.

[7] https://www.cloudflare.com/learning/serverless/what-is-serverless/
[8] https://enterprisetalk.com/guest-author/the-importance-of-the-citizen-developer-movement-in-a-world-driven-by-digital
[9] https://x.com/SaaSletter/status/1819381492902252916
[10] https://www.srgresearch.com/articles/on-premise-data-center-capacity-being-increasingly-dwarfed-by-hyperscalers-and-colocation-companies

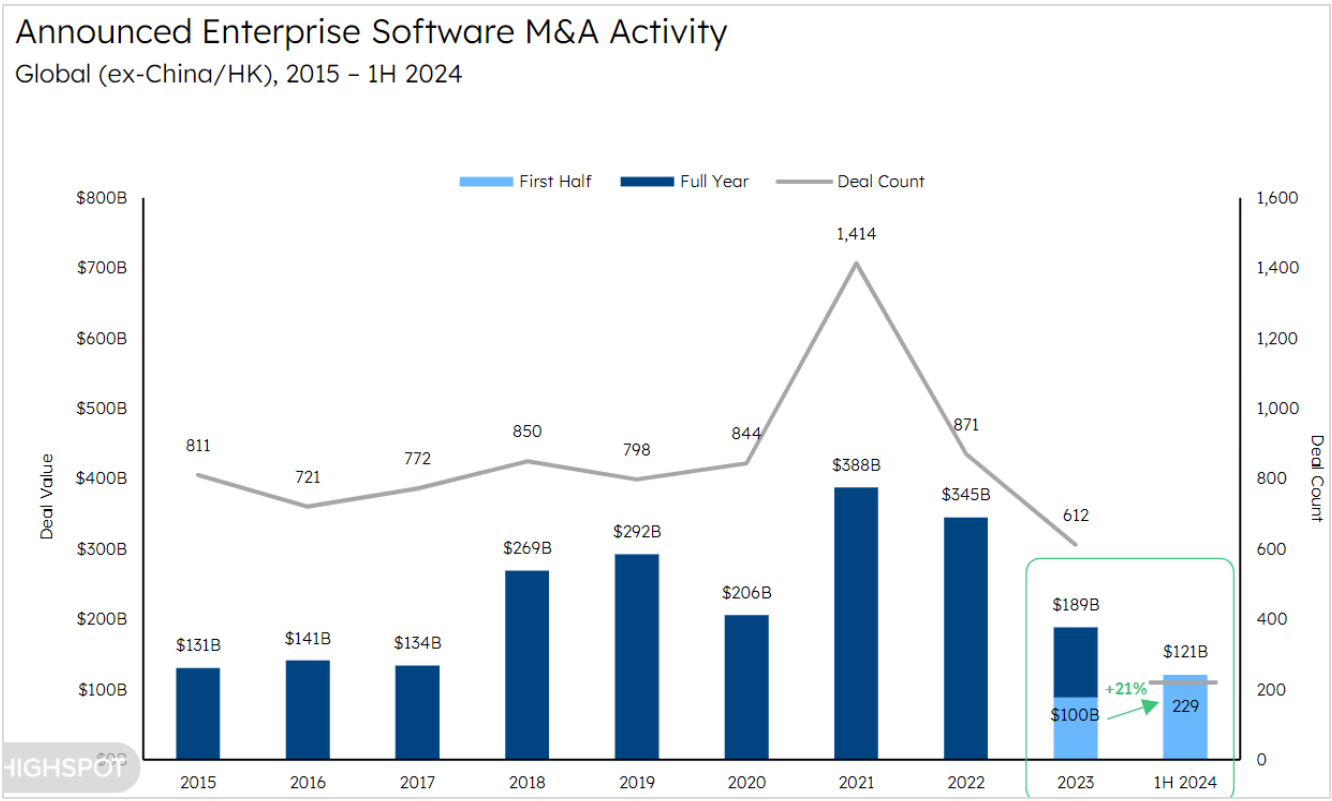




Source: https://www.bvp.com/atlas/the-cloud-100-benchmarks-report

What are Capital Markets Signaling about Cloud Computing?

Private Markets: The Cloud 100 list's aggregate value, published by Bessemer for private cloud computing companies, hit $820 billion this year—a 25% increase from last year and the highest in its history. Cloud 100 multiples have adjusted since 2021, dropping 31% and are expected to continue dropping potentially through the end of 2024. AI takes the top spot in valuation at $176 billion (21% of the list value), driven by enterprise demand for efficiency-enhancing AI solutions. Fintech follows closely with a combined value of $173 billion. Ramp and Brex, initially focused on corporate cards, are now firmly in the cloud sector with new software offerings such as accounting automation, expense management, and vendor management.[11]



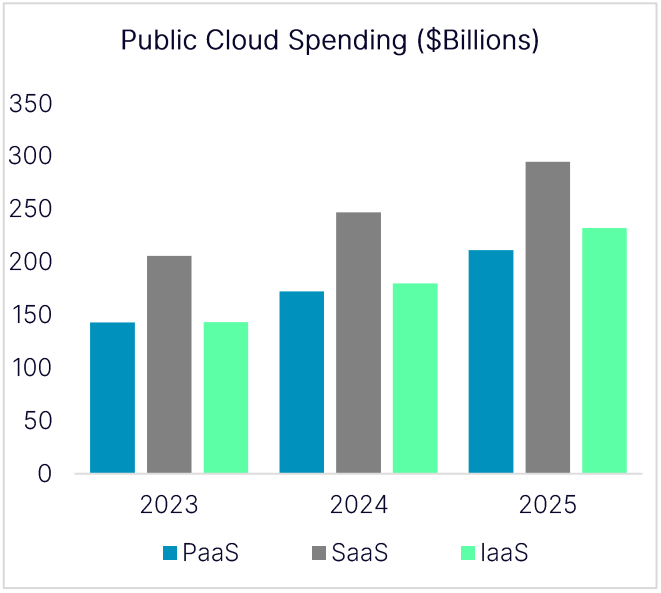
[11] https://www.bvp.com/atlas/the-cloud-100-benchmarks-report

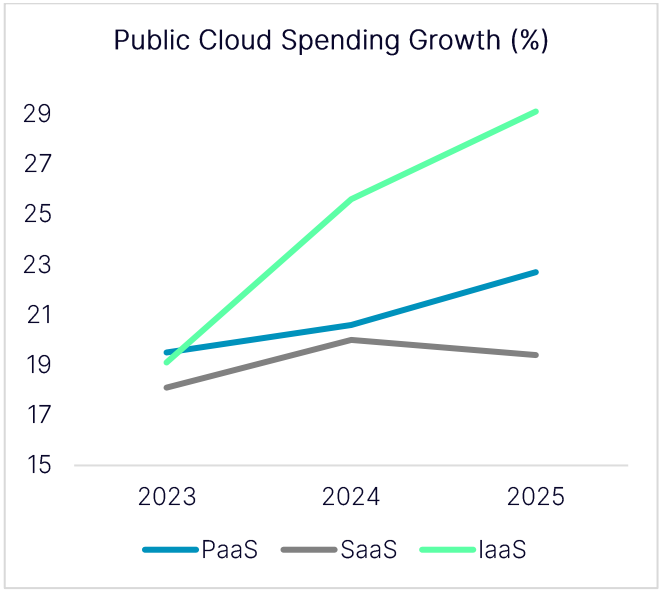
M&A: In the first quarter of 2024, there were 285 technology deals involving cloud services, amounting to a total value of $31 billion. The biggest disclosed deal in the industry was Hewlett Packard Enterprise's $14.3 billion acquisition of Juniper Networks. While the value of SaaS (Software-as-a-Service) M&A transactions increased during the first half of 2024, the number of deals decreased. Overall, the first half of 2024 recorded $121 billion in announced M&A transactions, a 21% increase from the $100 billion reported in the first half of 2023. [12]

IPO: While the IPO environment in 2024 is still far less active than in prior years—Klaviyo and Rubrik have been the only two to IPO from 2023's Cloud 100 list—the IPO window has opened somewhat, with Waystar and OneStream going public in June and July respectively. Some companies are also rumored to be considering an IPO later this year and early next year. This trend suggests a renewed interest from investors in cloud-based technologies and highlights the potential for significant returns.[13]

What is the Industry Outlook for Cloud Computing?

Driven by GenAI and application modernization, Gartner Inc. forecasts worldwide end-user spending on public cloud services to grow 20.4% to total $675.4 billion in 2024, up from $561 billion in 2023. The chart below shows that, according to Gartner, IaaS will have the strongest growth of the three major segments in cloud computing services, growing from $143 billion in 2023 to $232 billion in 2025, courtesy of the GenAI revolution currently underway. Additionally, IaaS is forecast to experience the highest end-user spending growth at 25.6%, followed by PaaS (Platform-as-a-Service) at 20.6%. Gartner sees the SaaS market experiencing slower growth relative to previous years, while remaining the largest segment of the cloud market in end-user spending, with projected growth of[14]





Source: https://www.gartner.com/en/newsroom/press-releases/2024-05-20-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-surpass-675-billion-in-2024

[12] https://view.sapphireventures.com/viewer/66a91ec66e143a04fa1a612f?hsCtaTracking=bad82de4-1583-4027-b2d2-9290e0e46e6c%7C608f35c3-abf6-4da6-af50-013f8da51cf5
[13] https://www.bvp.com/atlas/the-cloud-100-benchmarks-report
[14] https://www.gartner.com/en/newsroom/press-releases/2024-05-20-gartner-forecasts-worldwide-public-cloud-end-user-spending-to-surpass-675-billion-in-2024

How Can Investors Track Cloud Computing?

Nasdaq's ISE CTA Cloud Computing™ Index (CPQ™) was launched on December 31, 2007 to track the performance of companies involved in cloud computing. A security classified by CTA (Consumer Technology Association) as a Cloud Computing company falls under one or more of three buckets:

- Infrastructure-as-a-Service (IaaS): Companies that deliver cloud computing infrastructure – servers, storage, and networks as an on-demand service.
- Platform-as-a-Service (PaaS): Companies that deliver a platform for the creation of software in the form of virtualization, middleware, and/or operating systems, which is then delivered over the internet.
- Software-as-a-Service (SaaS): Companies that deliver software applications over the internet enabling other companies to conduct their operations using the application.

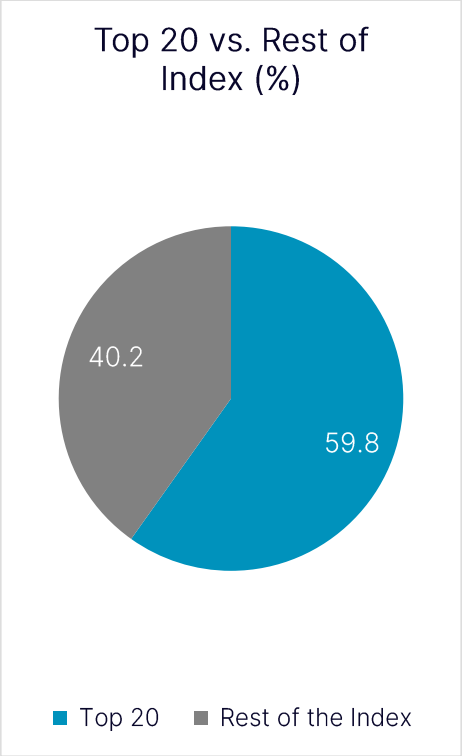
To be eligible for inclusion in the Index, a security must meet the following criteria:

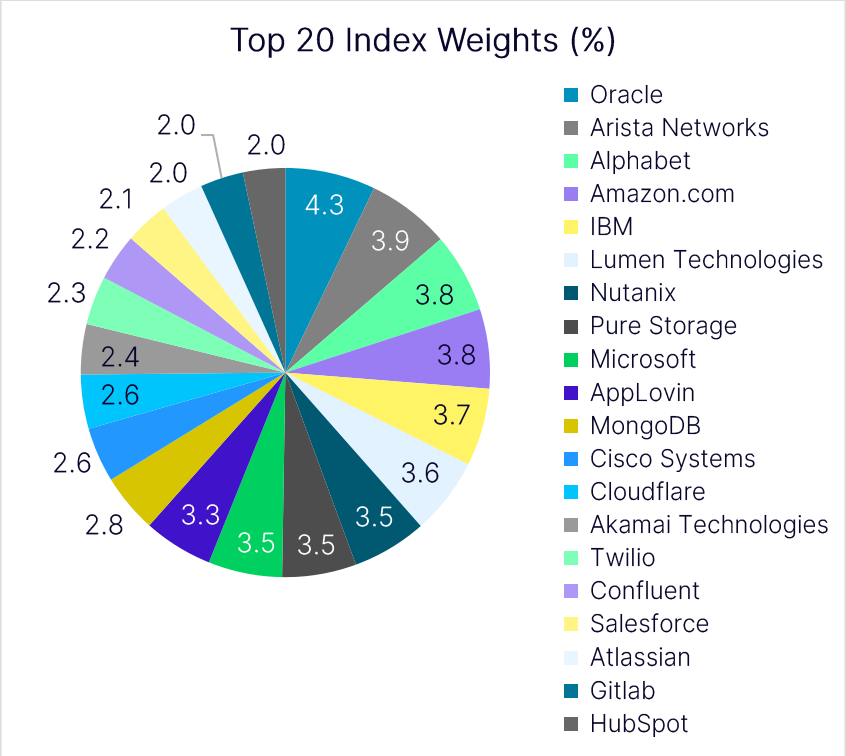
- Be listed on the Nasdaq Stock Market®, the New York Stock Exchange, NYSE American, or the CBOE BZX Exchange
- Be classified as a common stock, ordinary share or depositary receipt
- A minimum worldwide market capitalization of $500 million (USD)
- A minimum free float of 20%
- A minimum three-month average daily dollar trading volume (ADDTV) of $5 million (USD)
- One security per issuer is permitted
- Have "seasoned" for at least three months prior to Reconstitution effective date
- The issuer of the security may not have entered into a definitive agreement or other arrangement, which would likely result in the security no longer being index-eligible
- May not be issued by an issuer currently in bankruptcy proceedings
- The issuer of the security may not have annual financial statements with an audit opinion that is currently withdrawn

At each quarterly rebalance, securities are capped at a max weight of 4.5%, with a minimum weight of 0.25%. CPQ is a modified theme strength-weighted index targeting Infrastructure, Platform, and Software companies. Each Index Security's initial weight is determined by dividing its Cloud Score by the sum of the Cloud Scores of all Index Securities. The Cloud Score CSi for each security i is defined as $CSi = 3 \times IaaSi + 2 \times PaaSi + SaaSi$, where $IaaSi$, $PaaSi$, and $SaaSi$ are the security's three binary scores. In other words, higher Cloud Scores drive higher weightings for individual companies, and those participating in two or three of the categories will receive higher scores, all else equal.

Portfolio Breakdown

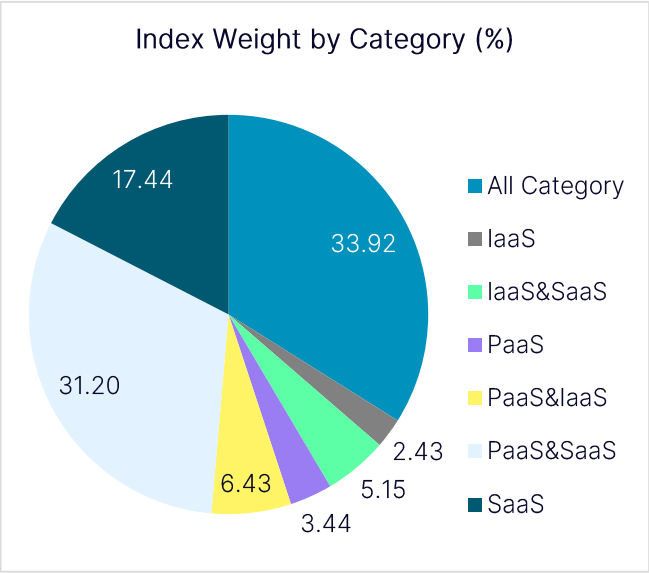
As of October 31, 2024, the top 20 companies constitute 59.8% of the index weight out of a total of 63 constituents, while the remaining companies represent 40.2% of the total index weight. The top 20 includes well-known technology giants like Oracle, IBM, Amazon, Microsoft, and Alphabet, which span all categories of cloud computing businesses (PaaS, IaaS, and SaaS) and are at the forefront of innovation in this field. Like these major names, many other cloud companies do not specialize in just one category; most of the top 20 companies engage in at least two categories, such as PaaS and SaaS, or IaaS and SaaS.

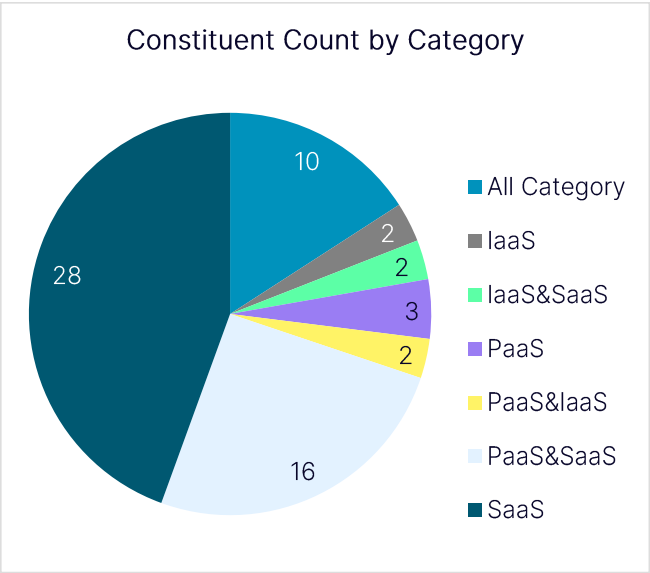




Source: Nasdaq Global Indexes as of October 31, 2024

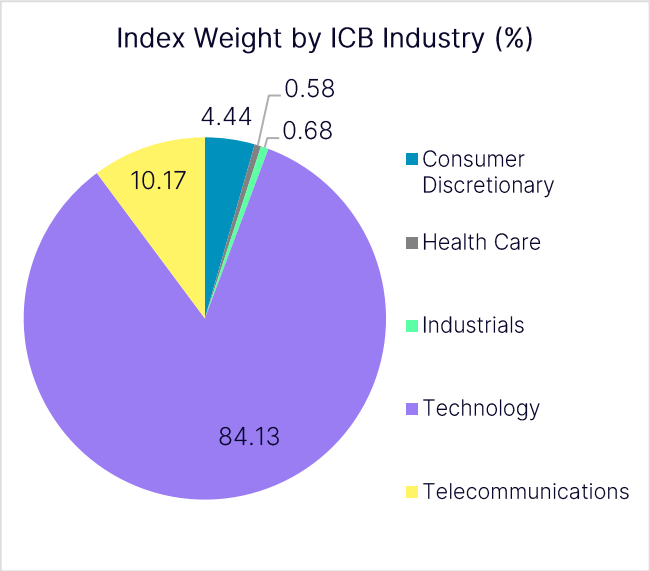
The that garner the highest weightings feature companies that span all three categories (PaaS + IaaS + SaaS), followed by SaaS only companies, and then those that engage in both PaaS and SaaS. Specifically, 33.9% of CPQ is composed of 10 firms with exposure to all three categories as defined by CTA. Constituent counts of SaaS companies outnumber those in the All Category group more than twofold, but contribute only half of the index weight of All Category due to the weighting scheme. The modified theme strength-weighted method assigns higher Cloud Scores and weights to those companies with more extensive exposure across multiple cloud computing categories.

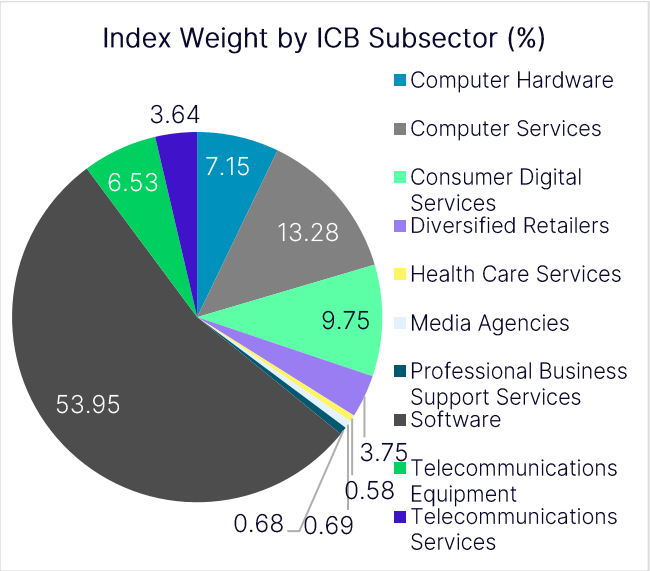




Source: Nasdaq Global Indexes, FactSet. Index weightings as of 10/31/2024.

It is perhaps not surprising that the Technology and Telecommunications sectors represent the two largest industry exposures (per the Industry Classification Benchmark, or ICB) within the CPQ index. Some companies not grouped under the Technology and Telecommunications sectors are classified otherwise due to their higher revenue generation elsewhere, such as Amazon (Consumer Discretionary) given its strength in retail. Similarly, certain software companies are classified under non-Software subsectors due to the concentration of their target clients. An example that illustrates the above is The Trade Desk, which assists advertisers in managing data, optimizing ad campaigns, and deriving insights, serving clients solely in the media sector. Consequently, this company is classified under Media Agencies, per ICB subsector. Regardless of their strict sector classifications, all of these companies contribute meaningfully to the cloud computing space and are continually evaluated on the strength of their contributions by CTA.

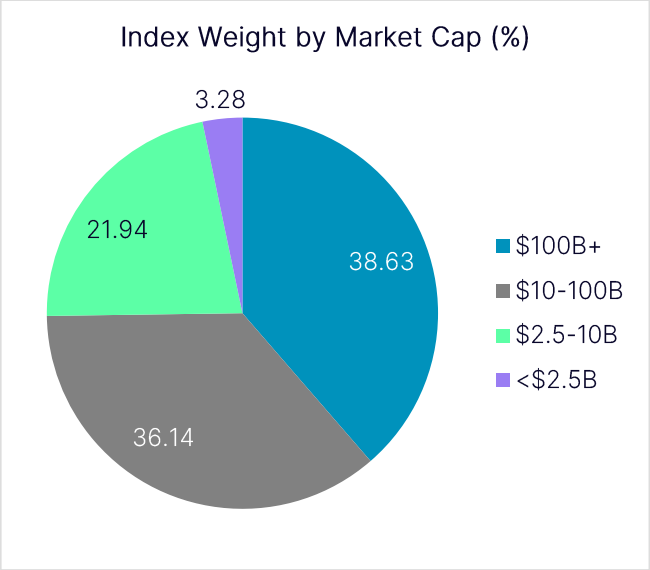


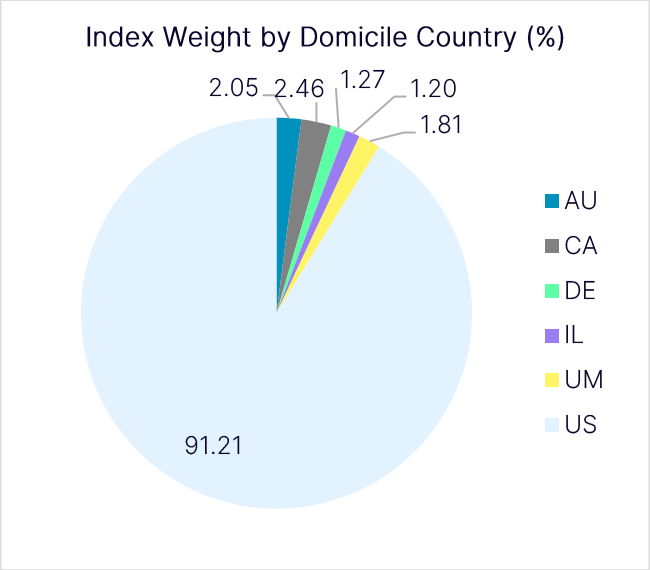


Source: Nasdaq, FactSet data as of October 31, 2024

As of October 31, 2024, the average market cap of the companies in the index was $171.8 billion, with a weighted average of $342.4 billion, and a median of $17.5 billion. This significant positive skew is due to the large market caps of Amazon, Microsoft, and Alphabet (Google), which range between $1.9 trillion and $3.1 trillion. Only 5 members are classified as small-cap companies with market caps below $2.5 billion, making up less than 5% of the total index weight. CPQ is still mainly an index of large-cap companies, with a substantial mid-cap segment.

In terms of geographic exposure, all companies are domiciled in developed countries. A significant percentage (91.2%) of index exposure is to companies that are headquartered in the United States, with only 6 domiciled elsewhere. Since cloud computing's emergence as a new offering within the technology industry, U.S. tech firms have leveraged their prowess in R&D to secure a first-mover advantage and dominate the market.





Source: Nasdaq, FactSet data as of October 31, 2024

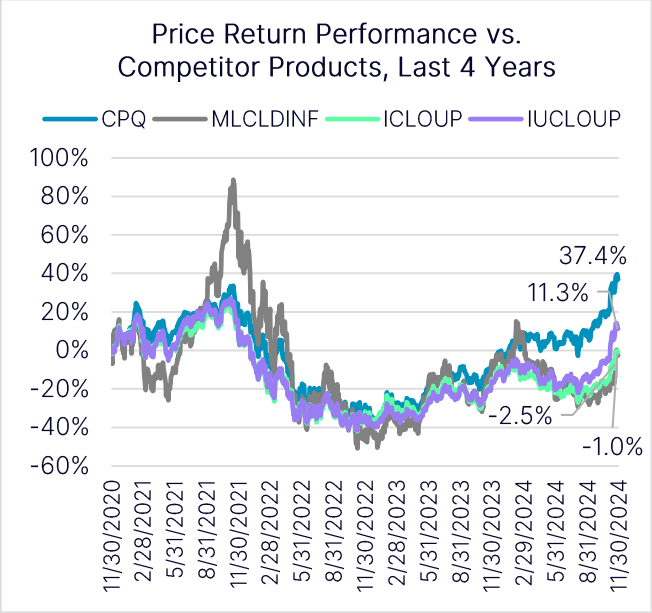
Sample Constituents

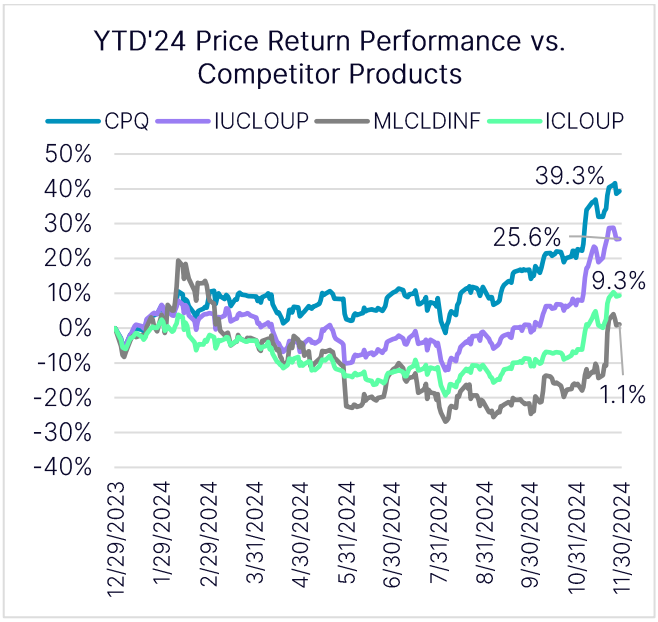
- PaaS & SaaS: MongoDB Inc.(2.78%)
  - MongoDB, Inc. (Nasdaq: MDB) engages in the development and provision of a general-purpose database platform. It provides both licenses and subscriptions as a service for its NoSQL document-oriented database. MongoDB's database is compatible with all major programming languages and can be deployed for various use cases.
- IaaS & SaaS: Cloudflare Inc. (2.56%)
  - Cloudflare, Inc. (Nasdaq: NET) engages in the provision of cloud-based cybersecurity services to secure websites. It offers various products for performance and reliability, video streaming and delivery, advanced security, insights, Cloudflare for developers, domain registration and Cloudflare marketplace.
- SaaS Only: Asana, Inc. (0.51%)
  - Asana, Inc. (Nasdaq: ASAN) engages in the business of developing a work management platform that helps organizations better orchestrate their work, from daily tasks to cross-functional strategic initiatives.
- All Categories: Alphabet, Inc. (Nasdaq: 3.76%)
  - Google Cloud is the third largest IaaS provider in the world. In addition to Google Cloud, Google maintains the App Engine, a full development and deployment PaaS product for companies. Google also maintains a fleet of cloud software offerings across various verticals.

Performance and Fundamentals

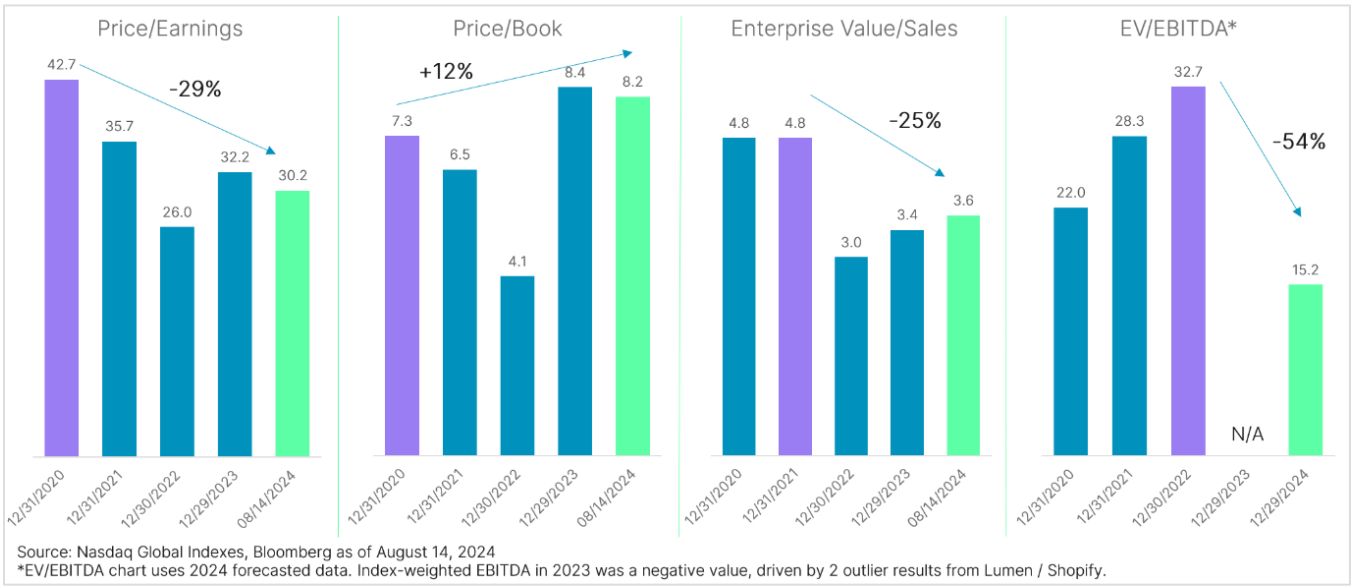
The CPQ Index has generated superior performance compared to some of its leading competitors during a challenging period for the cloud computing industry. For the four-year period ending November 29, 2024, CPQ generated positive price returns of 37.4%, massively outperforming the Indxx Global Cloud Computing Index (ICLOUP) and BofA Cloud Infrastructure Index (MLCLDINF) by nearly 40 percentage points each; it also outperformed the Indxx USA Cloud Computing Index (IUCLOUP) by approximately 26 percentage points. For

YTD 2024, CPQ has generated price returns of 39.3%, outperforming its competitors again by anywhere from 14 to 38 percentage points.



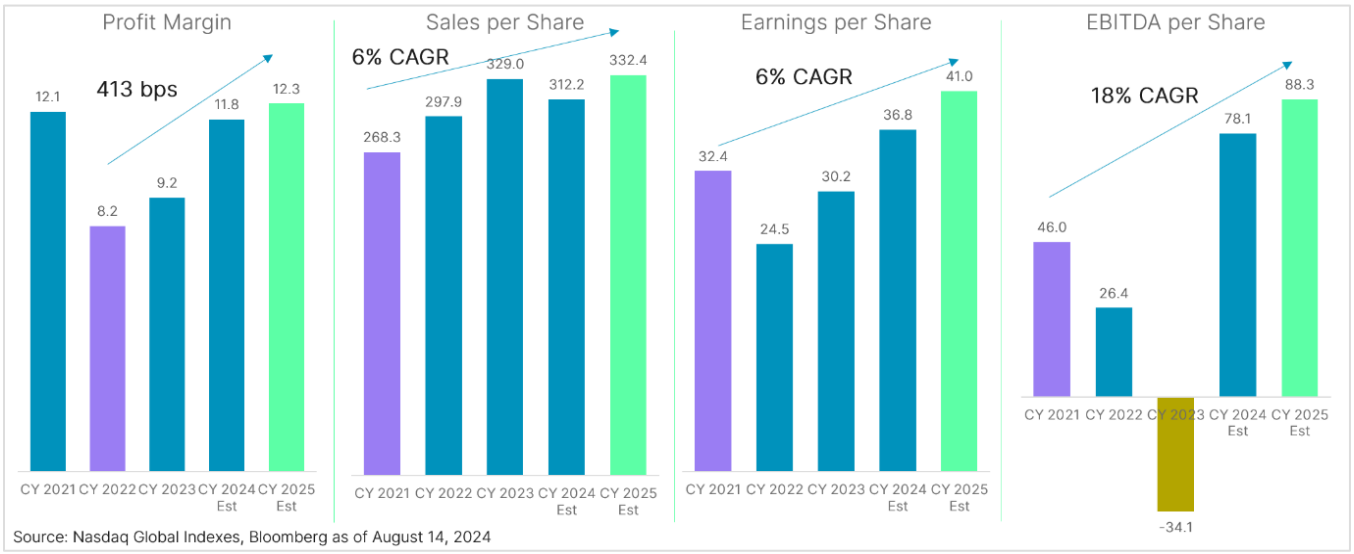


Over the course of the last several years, CPQ has become cheaper on a wide variety of index-weighted valuation metrics, including price-to-earnings (P/E), Enterprise Value/Sales (EV/Sales), and EV/EBITDA, despite its impressive price performance; price-to-book (P/B) was the only valuation metric that showed an increase vs. year-end 2020. In addition, CPQ became a little more expensive on EV/Sales basis over the course of 2024, while seeing its P/B and P/E ratio trend slightly lower.



Profit margins are set to expand by nearly 260 basis points year-over-year in 2024, recovering from headwinds experienced in 2022-2023. Consensus estimates for 2024 forecast a 22% growth in index-weighted earnings per share (EPS) compared to 2023, with an additional growth of 11% expected in 2025, leading to an overall

compound annual growth rate (CAGR) of 6% from 2021-2025. EBITDA is anticipated to recover into positive territory after a negative reading in 2023, resulting in an overall CAGR of 18% from 2021-2025. Sales are projected to decline by 5% in 2024 relative to 2023, accelerating to a 6% increase in 2025, culminating in an overall CAGR of approximately 6%.



There was clearly some weakness in the Cloud Computing space in 2022-2023, but some segments of the index were impacted more negatively than others. Companies engaging in All Categories showed solid growth in aggregate net income, revenue, and EBITDA in the trailing 12 months of data analyzed as of April 2024 (which encompasses all four reported quarters of financials in calendar year 2023), modestly trailing Software-Only companies (i.e. SaaS). Fundamental growth metrics were notably weaker for companies engaging in Software + 1 other area, and weakest by far for those with no Software exposure. Most SaaS companies are poised to benefit from the wave of AI innovation, largely due to their extensive user base. For instance, in the post-Covid era of more widespread remote work, few companies can avoid using CPQ constituents such as Zoom for online meetings, Appian and Asana for team planning, and Workday for personnel management. Integrating large language models (LLMs) or other AI tools into software is relatively straightforward and can significantly enhance efficiency, which is appreciated by both customers and investors. However, for developers of IaaS or PaaS, it is not as easy to capitalize on the AI wave. AI PaaS providers are investing heavily in capex to fund the acquisition of costly semiconductor chips and buildout of data centers that are required for the development of machine learning models. Among the leading companies in AI PaaS, Amazon and IBM stand out. This explains why Software Only and All Category have the best financial metrics, with these two categories accounting for 51.9% of CPQ weighting.

Conclusion

The current trends in cloud computing include cloud optimization, AI-as-a-service, sustainable cloud and serverless computing. Our analysis shows that numerous factors have driven the growth of cloud computing. These include significant cost savings for organizations and the ability of many businesses to compete with larger enterprises by scaling their infrastructure in the cloud rather than implementing IT resources on-premise. This shift has led to increased cloud computing spending, which is projected to continue as organizations further divest from physical infrastructures. As it has shown historically, Nasdaq's ISE Cloud Computing Index

(CPQ) is well-positioned to capture the future growth in this industry. Analysis of the index shows that it has significantly outperformed competing benchmarks over time. Additionally, many of the companies within the index have performed well in terms of revenue and net income growth in recent years, with weakness concentrated in a relatively small batch of constituents lacking meaningful SaaS exposure. The index thus offers balanced exposure to multiple growth drivers within the cloud computing industry, split across pureplay SaaS names, the vertically integrated hyperscalers, and those falling somewhere in between. CPQ is tracked by the First Trust Cloud Computing ETF (Nasdaq: SKYY), the First Trust Cloud Computing UCITS ETF (London: FSKY), and the ProShares Ultra Nasdaq Cloud Computing (NYSE: SKYU).

Sources: Nasdaq Global Indexes, FactSet, Bloomberg.