

Tech Spend in Cloud and Edge Computing 2023 and Beyond

Introduction

In 2022, the world started reopening after a couple of years of pandemic-induced lockdowns and truncated economic activity. Companies are navigating tough challenges such as changing customer preferences, intense competition, talent shortage, economic deceleration, and supply chain crisis accentuated by a prolonged war. According to Gartner, CEOs are betting big on digital and IT capabilities to help them navigate through the crises and deliver growth.



The goal of this article is to provide the reader with insights into investments that companies are making in IT, especially in Cloud and Edge Computing and how it is transforming their operations and helping them become more agile and resilient to disruptive changes.

Let us begin with Flexera's 2022 Tech Spend Pulse which has interesting findings to report. 71% of senior executives, majority of whom are working in the IT departments of companies across industries, expect an increase in budget allocations to strengthen IT. A significant number of executives (77%) reported that their company spends more than \$25 million on IT.



While software industry allocates the highest percentage of their revenue to IT (18%), the range is between 2% to 11% of revenue for companies operating in other industries.



Senior IT executives have further identified their key technology initiatives for the immediate future (2022-2023):

- (i) Digital Transformation (74%)
- (ii) Cybersecurity (73%)
- (iii) Cloud/Cloud Migration (65%)

The percentage of executives who reported cloud as priority has increased from **48%** last year to **65%** this year.



Role of Cloud in Industry 4.0

The cloud ecosystem is dominated by the top three hyperscalers – Microsoft Azure, Amazon Web Services, and Google Cloud Platform, who provide the following services: Infrastructure-as-a-Service (IaaS), Platform-as-a-Service (PaaS), and Software-as-a-Service (SaaS).

This study further helped us dissect the cloud spend to understand where the money is getting invested: Software-as-a-Service (69%), Public Cloud (59%), and Private Cloud (39%). Your business too will probably spend a significant portion of your IT budget on SaaS, Public and Private Cloud. These technologies will enable you to give employees and customers access to your services from anywhere and on any device. Leveraging these cloud technologies will help you offer better Customer Experience (CX) and Employee Experience (EX) which will lead to more revenue.

In the third quarter earnings this year, Microsoft reported a cloud revenue of \$25.7 billion which is a growth of 31% year-on-year and represents a little over 50% of total revenue of the company. Intelligent Cloud Services vertical earned the company a revenue of \$20.3 billion (26% growth year-on-year). Azure cloud services revenue was up by 42% YOY.

Amazon reported a 27% sales growth in Amazon Web Services (AWS) cloud business whereas the overall sales growth of the company stood at 15%. During the same period, Google reported an increase in revenue of 38% year-on-year from Google Cloud Platform while the company's overall revenue grew by just 6%. What this means is that these providers continue to anticipate significant growth in cloud migration and have made significant investment accordingly. These investments will continue to drive further innovation for companies in the areas of:

- Cloud Native Applications allow companies to build enterprise software applications that are custom-built for the cloud and allocate computing resources on-demand
- Microservices Architecture develop applications faster as a cluster of small and independent services where each service is designed for a specific business capability
- OevOps Automation provide a platform for automated deployments using continuous delivery tools to add new builds and features seamlessly and progressively

Speaking to the press, Sundar Pichai, CEO, reaffirmed that Google Cloud is winning customers across industries and geographies because of the trust and resilience offered by the cloud. To further strengthen this trust among customers and improve threat response capabilities of their cloud platform, Google has acquired Mandiant in a deal worth \$5.4 billion.

According to investment firm Wedbush Securities latest report, "shift to cloud is less than 50% penetrated."

This clearly shows that companies are still investing on IT hardware while they could be redirecting this investment into building cloud capabilities so that they can decouple software from the limitations of IT hardware and accelerate digital innovations.

We are still in the early stages of Industry 4.0 and the transition from 3.0 has been largely about building up cloud capabilities for storing and processing data centrally at the cloud. As companies continue to invest in connected enterprise solutions and Industrial Internet of Things (IIoT), the role of cloud in processing machine-generated data to derive real-time actionable insights assumes significance. The cloud proposition has moved up the value chain from cost-effective data storage to critical infrastructure that supports decision-making.

Take the case of a global leader in construction and mining equipment who started their digital transformation journey with a "paperless" office initiative by building an enterprise document management system. The company's application portfolio steadily increased to include intranet applications (for employees) and extranet applications (for customers and partners). As part of their modernization strategy, the company decided to migrate the global extranet portfolio of applications to the Microsoft Azure Cloud. Some of the applications were "lifted and shifted" directly from on-premises hardware to cloud infrastructure without any changes while a significant number of applications were refactored/rebuilt for the cloud to make use of the flexibility, agility, and resilience of the Azure cloud environment.

Understanding Cloud Spend through Use Cases Across Industries

The top 3 cloud service providers have reported an increased commitment from customers. Interestingly, the cloud use cases span multiple industries. We will look at a few recent examples.

- ✓ Automotive: Engineers at the BMW Group leverages Amazon Web Services (AWS) to process telemetry data generated by BMW vehicles.
- Aerospace and Defense: Raytheon Technologies has announced that in addition to empowering employees to collaborate better using Microsoft 365, the company will also tap into Azure Cloud Services to generate insights from data and augment predictive analytics capabilities.
- Construction: Trimble Construction Cloud, launched on 7th November 2022, makes use of Microsoft Azure cloud services to integrate disparate systems and create a common data platform that will streamline construction projects by increasing transparency, enabling collaboration, improving processes and automating workflows.
- ♂ Financial Services and FinTech:
 - (i) Lakeba, a Sydney headquartered global venture catalyst company has created a digital marketplace called DoxAI which is used by financial services companies to find and implement disruptive technologies. In November 2022, Lakeba has announced that they will be leveraging Microsoft Azure to scale their digital businesses securely. ANZ and Macquarie Bank are already using their product.

(ii) Google Cloud provides much needed scalability and compute power to Goldman Sachs for strengthening their risk management capabilities.

♂ Retail, Grocery Delivery and Consumer Packaged Goods

- (i) Schwan's Home Delivery, another AWS customer is increasingly leveraging the cloud to build capabilities that can help them reduce delivery times and offer personalized product recommendations to their customers.
- (ii) The Home Depot migrated on-premises data warehouse to Google Cloud's enterprise data warehouse to reduce cost and improve analytics capabilities. THD has also realized the benefit of moving to the cloud by effectively scaling e-commerce site to manage surge in usage during peak times and building an app to help customers avoid crowd inside their stores and collect their purchases from the curb.

♂ Sports and Entertainment

(i) Bundesliga has scaled AWS capabilities to create two new Match Facts that provide real-time visibility on performance to the fans.

Cloud Capex Trends and Forecasts

In October 2022, Gartner released an interesting survey of CIOs and tech executives to find out about IT budgets and top priorities in 2023. While tech executives expect IT budgets to raise 5.1% next year, the focus will be on accelerating "time-to-value." However, a high percentage of executives surveyed said they will be increasing investment in the following areas:

- ♂ Cybersecurity and Information Security (66%)
- ♂ Business Intelligence and Big Data Analytics (55%)
- ♂ Cloud Platforms (50%)
- ♂ Artificial Intelligence (32%)
- Hyperautomation (24%)

This forecast is largely in-line with the predictions of Market Analyst Mehdi Hosseini who works with Susquehanna Financial. He expects big tech spending on cloud to grow 23% in 2022 but it will be followed by a slowdown in 2023 as companies enter a "digestion phase".

Macro Headwinds

Business leaders across the globe must contend with macro headwinds (inflation and rising input costs, the great resignation and talent shortage, and supply chain disruptions) next year that threaten to unravel the hard-won growth following the easing of pandemic restrictions.



Micro Factors for Slowdown in Cloud Spending

COVID-induced digital transformation initiatives by enterprises across the globe had accelerated spending on cloud technologies during 2020 to 2022 but the same momentum may not continue at least in 2023. Let us understand why through a recent case study.



Fiserv, a Wisconsin-based financial services company, recently deepened partnership with Microsoft Azure to rollout a global payment processing solution on the cloud. The objective was to reduce their dependence on own datacenters, optimize costs through simplified operations and increase compliance and security. For financial institutions, change in systems happen once every few decades, and the average duration of such a transformative project is normally 3 to 4 years. Fiserv estimates that customers will take about 12 months to migrate to the new enterprise payments platform on Azure.

Companies like Fiserv who have invested in cloud capabilities in the last couple of years will likely pause to evaluate their investment and measure ROI in terms of customer experience improvements.

Analysts at Morgan Stanley expect cloud spending to decelerate in 2023 across industries and the growth rate is expected to slow down to 5%. The reasons attributed to this slow down are:

- (i) eCommerce surge in COVID years might take a pause as customers prefer 'phygital' (physical and digital) experiences more than just pure digital services.
- (ii) Travel and tourism industry is set for revival, and this will result in customers spending less time online consuming content such as videos and games.

However, research firm Forrester has made an interesting prediction for 2023: demand for edge computing will drive investments in both edge and cloud computing as companies continue to back technologies such as business-wide networking and confidential computing.

Cloud and Edge Computing – IT and OT Convergence

While CIOs and CTOs were traditionally responsible for managing the IT infrastructure and applications required to run business operations, Chief Operating Officers of manufacturing companies managed plant operations and the plant-level Industrial Control Systems (ICS) – the hardware and the software required to run and manage plant operations. The analysts at McKinsey observed that the COOs are increasingly depending on the IT teams to manage plant operations where machines are equipped with IoT devices.

Industry 4.0 is Transforming Production and Supply Chain

A study estimates that, by 2023, more than 43 billion devices, including machines, mobile devices, and automobiles, will be connected to the internet. Industrial Internet of Things (IIoT) is a network of machines equipped with sensors, actuators, and communication capabilities to generate and transfer data to the cloud for analysis.

This represents a significant challenge to IT teams that have traditionally managed the infrastructure required to store and process data. Cloud computing enabled IT infrastructure teams to secure information while making sure that the people in their organizations take better decisions by leveraging data.

The modern CIO should continually examine the product/service lines of their organization to see if they can take advantage of cloud and IoT by redesigning/reconfiguring these lines. For instance, Globalmatix, a telematics solution provider, partnered with Thales, a global digital security company, to create a car-to-cloud solution for Porsche Racing Team. The solution basically collects data from sensors embedded with the vehicle, encrypts the data, and transfers the data using 4G cellular networks to the cloud. Cloud Native Analytics Applications converts data from the many systems within the vehicle into real-time intelligence that predicts and responds to threats such as impending engine failures.

There are many more such cases where Industry 4.0 has resulted in a convergence of IT and OT systems. The CIOs and CTOs now manage cloud infrastructure required to centrally process business and operational (machine) data in the cloud.

♂ Use Cases for IT-OT Convergence

- (i) Real-time monitoring of industrial equipment and vehicles
- (ii) Remote diagnostics capabilities
- (iii) Predictive maintenance

♂ Challenges in Processing OT Data in the Cloud

In the initial days of Industry 4.0, IT teams completely depended on the cloud for sending and processing data generated by IoT-enabled machines and equipment. There were a few challenges in using the cloud for OT data that sometimes resulted in system failures and prevented organizations from realizing the full benefits of smart manufacturing:

- (i) Latency time delay between data generation, processing at the cloud, and event response
- (ii) Security hackers gain access to production floor through cloud vulnerabilities
- (iii) Network Bandwidth require significant bandwidth to transfer huge amounts of data generated by connected machines in the shop floor to the cloud
- (iv) Communication Breakdowns network disruptions prevent data communication between machine and cloud

Tech Spend in Edge Computing and Role of 5G

Edge computing helps companies mitigate the risks and challenges faced in analyzing data from IoT-enabled machines. Along with sensors and actuators, the edge devices are equipped with processing/computing resources that can run applications to analyze data from their environment.

Industry experts believe that edge computing will get a boost from increased rollout of 5G services as companies invest in creating "Edge Clouds", a grid of compute and storage resources embedded in machines connected locally. Edge clouds will enable IT teams to run complex applications and machine learning models to detect patterns that can enhance machine productivity and efficiency while being able to respond to anomalous events faster such as sudden change in process variables leading to a decision to shut down or temporarily suspend operations.



The "State of the Edge" report released by The Linux Foundation mapped the edge footprint by 2028 as follows:

- (i) 37% for mobile and residential customer use cases
- (ii) 63% for running applications in industrial verticals

The top industrial verticals for edge adoption are manufacturing, energy, logistics, smart cities, healthcare, retail, and transportation.

Combine this with the findings of the Cybersecurity Insights Report released by AT&T: At least 1 edge use case will be implemented by a staggering 77% of energy and utility companies worldwide.

The Edge Strategy of the Hyperscalers

Edge computing will play a complementary role to cloud services as it allows companies to choose whether a particular type of data (based on sensitivity) will be processed at the cloud or at the edge. Edge computing is an extension of hybrid cloud model where public cloud and private cloud was used together depending on the type of information processed. In the future, edge computing will be seen together with cloud computing as a "fabric" of compute resources available on-demand.

Let us understand the investments the hyperscalers have made in offering edge computing services:

O Amazon Web Services

AWS customers can leverage Amazon Elastic Container Service and Amazon EKS Anywhere to deploy containers and Kubernetes clusters at the edge. AWS IoT Greengrass empowers IT teams to create ML-enabled IoT Applications for local data processing and analysis.



Google Anthos

Hybrid cloud management platform, Anthos, allows IT to deploy apps on Google Kubernetes Engine (GKE) and VMs. Companies can roll-out Kubernetes clusters in the edge environment. Anthos offers 75% reduction in CPU requirements and 90% reduction in memory requirements thereby making an interesting use case for running low latency applications at the edge.



Microsoft Azure

Azure Private Multi-Access Edge Compute (MEC) helps companies create a private network and create low-latency solutions (applications and services)

Furthermore, for edge use cases, companies can leverage Azure Arc, a multi-cloud platform for running cloud native applications, machine learning services and database services.

Microsoft's Executive Chairman and CEO, Satya Nadella, in his latest earnings presentation in October 2022, reported that Azure Arc already has 8500 customers which is a 100% growth from a year ago period.



Conclusion – The Next Phase of Growth for Cloud and Edge Computing

The pandemic followed by economic downturn and a prolonged war which is causing severe supply chain constraints has forced businesses globally to become composable. Composability means a business is built as a collection of modular and interchangeable components where each component is independent and integrated with each other.

Composable organizations are building an enterprise-wide digital fabric through initiatives such as:

- (i) Modernizing infrastructure and applications to process data faster
- (ii) Integrating applications to break down data siloes
- (iii) Automating processes to reduce human intervention/dependencies
- (iv) Creating a digital twin for real-time monitoring and predictive maintenance

Cloud and Edge are important tech enablers for companies to become composable. According to 2022 State of the Cloud Report released by Flexera, companies are focusing on optimizing cloud usage, migrating additional workloads and moving software to the cloud to leverage resilience, availability, and scalability offered by SaaS applications.



The state of the edge report estimates that upwards of \$800 billion will be spent globally in the assessment period between 2019 and 2028 on IT server equipment and edge computing facilities. This represents a significant opportunity for not just hyperscalers but application development companies, SaaS companies, IoT hardware manufacturers, edge computing infrastructure providers such as Cisco and Juniper Networks, CPU technology companies such as Intel, AMD and Nvidia and semiconductor manufacturers such as Xilinx, Achronix, Microsemi and Microchip.

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