Open Source Software on Cloud

The Biggest Paradigm Shift in Technology Today

Whitepaper

Abstract

Organizations across the globe have recognized the cloud as a game-changer in business transformation and innovation. The dynamically changing business environment has constantly challenged the existing IT landscape, compelling businesses to either adopt newer cloud-based paradigms or end up losing the game. Further, the Covid-19 pandemic has amplified demand for the cloud which in turn is driving open-source adoption. With OSS, businesses are gaining agility and the ability to innovate and experiment faster, and hence there is a rising trend towards OSS in Cloud. With mechanisms for sharing and operating services online, the cloud is now the backbone of our economy. Service providers, along with their clients and cloud systems, are marching towards future-proofing businesses.

Furthermore, the cloud empowers enterprises to embrace the benefits of technology and thereby focus better on their product offerings. Open-source adoption also works best in organizations that need quick time to market their solutions and reduce the total ownership cost. Using OSS, developers can benefit from importing the existing work and easily pull new applications together. Also, open-source stacks are well supported across cloud providers, thus easing the migration process from one cloud provider to another. The rise of open-source, especially in the Machine Learning domain, has also made cloud providers support OSS for development in Machine Learning services.

A managed open-source provider can provide a solution to some of the critical challenges associated with open-source software, thus allowing a business to get the best out of OSS without taking on maintenance responsibilities. MSPs also take care of the implementation and security, enabling the in-house developers to focus their time on other critical issues that will help drive their business forward.

1. Rise of Open-Source Software

1.1 Recent Trends

Cloud Adoption Drives OSS Creation

Adopting a cloud-based open-source technology empowers enterprises to accelerate innovation, create & deploy applications faster and enhance consistency. Forrester forecasts that the global public cloud infrastructure market will soon expand and witness a 35% growth, reaching 120 billion dollars in sales. The principal driver for cloud adoption is the same driving open-source adoption - business agility and the ability to innovate and experiment faster.

Image Source

The above figure depicts different cloud computing layers used across enterprise applications and the respective open-source products, tools, and software that map to each cloud computing infrastructure layer.

Faster Rate of Innovation Using OSS

The open development model and contributions from large enterprises such as - Amazon (AWS), Microsoft (Azure), and Google (Google Cloud Platform) - ensure that open source is at the very cutting edge of innovation. Open source and permissive licenses enable agility and capabilities to move faster, experiment and innovate, which are all critical to get that extra mileage in business. Businesses also need to find a mix of solutions - such as some combination of open-source software and cloud technology that work best for them and their individual use cases. Solutions implemented with adequate support can help businesses grow, remain agile, and innovate fast.

Big Vendors Continue Investing in OSS

Businesses are now shifting to open source as it is driving business growth. IBM, SAP, and Adobe are some of the most prominent names in technology that are actively participating in the open-source community. Also, maintaining the same products requires a more incredible speed of deployment in this competitive and volatile market in the pandemic era. Most importantly, there's immense value in building on the existing foundation of technology without re-inventing the wheel. Further, developers can build applications at large volumes by reusing open-source code rather than starting from scratch. Enterprise IT teams can integrate open-source tools into their existing workflows and manage their data with enhanced precision. This control is more critical now, given the overall shift toward digitalization following the pandemic, which increases the amount of data itself.

Chart: Competitive Advantages of the Open Source Model

Business Attribute	Gen 3 Open Source (2019)	Gen 1 Open Source (2009)	Closed Source
Market Size	Large	Small	Large
Innovation Velocity	High	High	Low
Customer Acquisition Costs	Low	Low	High
Average Selling Price (ASP)	Low	Very Low	High
Market Elasticity	High	High	Low
Customer Lock-in	Low	None	High
Cost of Development	Low	Very Low	High
Lifetime Value	High	Low	High
Cloud First	High	Low	Low
Business Value	**High**	**Mid**	**Mid**

Competitive Advantages of the Open-Source Model
Image Source

Stringent Information Security Measures

Adequate enterprise security - which ensures that all the cloud infrastructure components are secured against the fast-growing security threats - is the need of the hour. Applications and endpoints need to be protected from the application perspective, and users are granted access as per the eligibility configuration based on role-based access control. Advancements in cybersecurity guarantee that Cloud access is secure. External Cloud providers such as AWS and Azure have strict security policies in place, which include physical security policies that minimize access. Oauth2 and OpenID are a few of the open-source tools that can be used for enterprise security.

1.2 Reasons Behind the Rise of the Current Wave

Force multiplier: Users treated as co-developers

Using open-source software, developers can contribute back by reporting bugs or even submitting proposed fixes, and can also easily continue to benefit from the subsequent fixes and improvements offered by others.

Open source has established itself as a force-multiplier for developers, in three distinctive ways:

- Firstly, the diversity of ideas that emerges intrinsically surfaces better solutions than if the marketplace of ideas was limited.
- Secondly, additional human capital is available to tackle the challenge - meaning the solution has more developer hours thrown at it - at no extra cost.
- Finally, more users mean more use cases being explored, translating to more robust code.

Customization

Open-source projects are modularly architected and thus provide both the flexibility and the robustness of the code. By nature, open source is built for a variety of use cases, environments, and users. It means more options and a tendency to encourage more modularity resulting in greater flexibility and lower customization costs in the long run.

Interoperability

The adoption of open-source software enhances the interoperability with other enterprise solutions. With data transferability and open data formats, there lie greater opportunities to share data across interoperable platforms.

The popularity of Docker & Python

Docker is an open-source container technology utilized by developers and system admins to build, ship, and run distributed applications. Docker has been a game-changer since its release in 2013 and has today become a massively popular containerization technology.
Python is the #1 programming language for data science and artificial intelligence applications. It also has a very extensive developer community where developers exchange codes & ideas. According to analysts, one of the reasons behind its continued relevance is its ease of use and high adaptability.

Abundant Training Resources

Open source is an excellent way of learning how to code. Users can read the documentation of the software that powers it and even join the local meet-up for the framework or language. Developers can also submit a pull request to the project to fix a minor bug or add a new feature and all of this comes without any direct cost. Thus, nearly every coding school today teaches open-source. Irrespective of the open-source project type (internal or external), it can supply source code, design documents and provide opportunities to try out new ideas and discuss them with designers and implementers.

1.3 OSS Adoption Stories

Several organizations have now opted to use open-sourced technologies to develop their products and even use open-source tools designed for internal usage.

Netflix and Uber are excellent examples of OSS adoption in organizations that need quick time to market their solutions while being start-ups. Both use prevalent OSS languages such as Java, databases such as MySQL and Cassandra, and open-sourced tools developed internally. Photon (for content encoding) and Security Monkey (AWS security monitoring) are open-sourced by Netflix while maintaining projects like RESTify. Uber has also open-sourced projects like Jaeger Tracing (distributed tracing), Ludwig (No-Code ML), and Pyro (Native Probabilistic Programming Language).

Spotify is another recent instance of OSS driving design and innovation in an organization. Kubernetes empowered Spotify to build and deploy new features without managing the infrastructure or scaling around it. Spotify's data pipelines and machine learning were moved to Kubernetes to utilize its highly distributed structures and build ephemeral environments.

2. Enterprise Adoption: Why and How

2.1 Cost Savings

By adopting open-source software, companies can reduce their up-front cost as the software is often free-to-use or has a relatively low cost with no licensing/operating expense. So, using open-source software significantly minimizes the total cost of ownership compared to the closed-source and proprietary alternatives. More importantly, what makes OSS unique is that businesses are not required to pay for the right to use the underlying intellectual property.

2.2 Flexibility

The most common concern for businesses is being locked-in to working with just one cloud partner. In open-source, there are no vendor lock-in restrictions - so seamless integration of the enterprise applications, products, and systems developed by different organizations is possible. By adopting a targeted approach, businesses can get the best services from multiple providers that suit their needs. They can also put technical measures in place to avoid lock-in - such as using open standards like open SQL or PostgreSQL - rather than a proprietary database. Containerization, such as Kubernetes, allows businesses to switch between architectures smoothly. Further, open source is transparent and open to inspection, thus granting businesses the capacity to utilize and process their own data, notwithstanding what would happen to a single vendor or a single product.

2.3 Speed & Innovation

The growing consumer demands for new digital communication tools challenge IT teams to create and manage them instantly. Also, as opposed to the pre-Covid times, enterprise IT teams are now distributed and fully remote in some cases. Further, they need to organize their work around new applications and develop them in days or weeks instead of months or years. Thus, integrating open-source code can be the fastest way to develop most software. With open-source, developers can take advantage of importing the existing work and pull new applications together, faster.

One of the most significant benefits of open-source projects is that people often develop very innovative new features and applications, thereby providing much-needed momentum to the project. It can also help businesses reach a new audience, drive technology forward, increase market size, generate positive publicity, and most importantly, stay ahead in the race. With open-source, access to the source code allows developers to apply fixes conveniently and not wait for the publishing organization's release cycle.

There is also a time-to-market benefit for open-source. Using available open-source code in a project benefits a company by avoiding re-inventing it and speeding up getting to market. The most significant effect is that a company can bring out an excellent product quickly, especially one with a more substantial number of already proven features and better quality.

2.4   Community Resources

Enterprises are not only using open source for internal transformations but also contributing open-source tools to the community, thus improving their visibility and relevance. The worldwide open-source community accelerates the innovation and development of various open-source software projects. The open-source community organizes conferences, groups making code more accessible, and developers contribute to repositories such as Open Source for Good with open-source code. The source code is made available for the community, adopters, and end-users to further study and modify the software and redistribute copies of either the original or the revised version free from any royalty.

2.5   How the Pandemic Accelerated OSS Adoption

Prior to the Covid-19 pandemic, companies were localized and restricted, but the transition to remote work has begun to change that. The pandemic has disrupted the existing tech trends and has amplified the demand for open-source software solutions. The need for developing new applications and scaling the existing applications skyrocketed during the pandemic as organizations tried to respond to the increasing demands. It thus led to a shift of focus towards technologies that can be implemented faster - which OSS provided over commercial software - due to the available resources and reusability of the existing implementations.

Businesses have been continuously challenged during this period of unprecedented change, and it necessitated preparing for life post-Covid-19 by figuring out how to stay ahead of the competition as we move towards a 'new normal'. Enterprises have

increasingly shifted to open-source software solutions in 2020 to fulfill their organizational needs and address new market requirements for quality and speed. Increasingly, open-source technology is being chosen as organizations seek a competitive edge and the latest innovations.

A recent survey found that over 90 percent of enterprise cloud developers believe open source will be a part of the future of their organizations. Similarly, another research found that almost half of the organizations rely more on open source due to the

pandemic. Thus, growth in the adoption of open-source software (OSS) has only accelerated over the last year, since the onset of the pandemic.

3. Cloud Hyper-scalers

3.1 Cloud Provides Compute on a Scale for Running Heavy-duty OSS Workloads

Forrester predicts the return to hypergrowth of the hyper-scale public cloud market and a spike in cloud-native tech demand as serverless containers heat up. Since the pandemic outbreak, as the world moved online, the cloud computing market has surged, which eventually led to years of digital transformation efforts compressed into months and, in some cases, even weeks. Gartner further predicts that by 2022, the public cloud computing market will be worth $397 billion and could be as high as nearly $700 billion by 2025.

Hyperscale cloud providers such as Microsoft Azure, Amazon Web Services, and Google Cloud have the scale, expertise, and cutting-edge innovation capabilities to ensure businesses can reap all the benefits that the cloud has to offer. The different types of compute options offer various benefits in the application lifecycle. For the initial development, PaaS options such as AWS EBS and Azure App Services allow developers to quickly deploy and test the applications initially, which helps develop new applications. Other computing services also provide opportunities to run the applications for specific tasks by leveraging the platform supplied by different cloud providers, such as scheduled jobs, batch workloads, machine learning, etc.

3.2 OSS Acts as a Consistent Element in Hybrid Cloud Setups

Hybrid cloud customers generally host their business-critical applications on their own servers for better security and control. They only store their secondary applications at the cloud provider's location. The basic difference between hybrid and multi-cloud is using multiple cloud computing and storage devices in a single architecture. OSS stacks are well supported across cloud providers and can act as the common layer in the multi-cloud and hybrid cloud setups without significant changes in the functional code. It thus eases the migration process from one cloud provider to another.

3.3 Cloud Providers Embracing Open-Source Stacks for Existing Services

Interestingly, the service offerings of major cloud providers (Microsoft Azure, Amazon, Google) support the use of open-source. As a matter of fact, nowadays almost all major cloud providers have started supporting open source in most of their existing services. For example:
- Compute (Azure App Service, AWS EBS)
- Database (AWS RDS, Azure Database for MySQL/PostgreSQL/MariaDB)
- Analytics, and
- Machine learning (AWS SageMaker, Azure ML Studio).

Earlier, smaller companies employed open-source to compete with the more prominent players directly. For example, Red Hat used open-source Linux to go against the Microsoft Windows monopoly. Xen and KVM projects competed against VMware in virtualization and Postgres and MySQL against Oracle in databases. Now, we are seeing open-source companies built in (and for) a cloud-native ecosystem. Previously, older open-source companies were mostly open-source versions of existing on-premise systems. The present-day companies are making a market impact faster than those from earlier generations - because they combine the low friction distribution of a cloud service with the openness of open-source communities - to reach out to the developers.

Although the biggest beneficiaries of open source are the Big-3, some growing groups of open-source companies are also coming up as successful challengers. Companies such as CockroachDB, Chronosphere, Confluent, Databricks, Elastic, Hashicorp, MongoDB, MuleSoft, Postman, Redis Labs, and Temporal have achieved multibillion-dollar valuations in recent years.

4. LTI's Embracement of Open-Source & Azure

4.1 Microsoft's Open-Source Adoption

Microsoft, a tech giant known initially for its opposition to the open-source software paradigm, turned to adopt the OSS approach in the 2010s. From the 1970s through the 2000s, Microsoft viewed the community creation and sharing of code as a threat to its business. However, in the 2010s, as the industry turned towards the cloud, embedded, and mobile computing (technologies powered by open source), Microsoft gradually moved towards open-source adoption.

Since 2017, Microsoft has been one of the most prominent open-source contributors globally. And today, Microsoft attributes the increased adoption of its software development platform to open source and cross-platform support.

- **GitHub Acquisition**: In 2018, Microsoft acquired GitHub, the most prominent host for open-source project infrastructure and it validated and legitimated open-source culture among Windows developers. Microsoft is among the site's most active contributors.

- **Open-source .NetCore**: Prior to open-source, .NET operated only on Windows. Microsoft open-sourced some of its code including .NET Framework in 2014 to promote its software ecosystem and stimulate cross-platform development, and later also credited open-source for the increased adoption of its .NET software development platform.

- **Expanding Linux**: Microsoft has also made investments in Linux development, server technology, and organizations such as the Linux Foundation and Open-Source Initiative. Linux-based operating systems power the company's Azure cloud services and provide flexibility in retaining access to the existing vendors/apps/workloads. The expansion further includes the addition of WSL (Windows Subsystem for Linux) as a compatibility layer for running Linux binary executables in ELF format natively on Windows 10, 11, and 2019. WSL is an element of the Windows OS that enables the user to run a Linux file system - along with Linux command-line tools and GUI apps - directly on Windows, unmodified, without the overhead of a traditional virtual machine or dual-boot setup, alongside the traditional Windows desktop & apps.

4.2   LTI's OSS on Azure Practice

Every category of Azure services including Compute (App Service Functions), Data (Data Factory, Data Bricks), Analytics (Synapse), and Machine Learning (ML Studio, Cognitive Services) support OSS. Azure Database for OSS offers the capacity to scale performance with little or no downtime built-in. LTI has imbibed "**OSS on Azure**" as a dedicated practice to traverse the path that Microsoft has taken with Open-Source adoption in Azure. Thereby, we have extracted the best value out of the innovation in the space for our clients. It includes providing solutions aligned with the advancements in containers with AKS and OSS-driven transformation of AI/ML/DS workloads by leveraging Microsoft's expertise in these domains.

4.3   LTI's Success Stories

OSS on Azure sub-practice has designed and implemented various solutions leveraging the recent open-source additions in Azure services.

1	2	3
We have operationalized Risk Prediction of Machine Learning models for a client in the Insurance domain using Azure Machine Learning Studio and created Azure Data Factory pipelines to gather and transform the feedback data received from the users. The models and the data transformation logic were written in R scripts, while the backend system was designed using .Net Core.	We have migrated the customer acquisition applications of a loyalty card provider from an on-premises server and AWS to Azure. These recent improvements in support for open-source languages in App Services simplified the Ruby-on-Rails backend migration with minimal change requirement within the functional code, while the available deployment options allowed for a robust setup of a multi-region Hot-Hot Active-Active Disaster Recovery Setup. Additionally, the variety of programming stack options for Azure Functions, including Custom Handlers for unsupported languages, simplified the migration of background jobs written in Kotlin.	We have designed High-Performance Applications for an OTT platform to provide search and health check capabilities for millions of requests within a short response time of 50ms. This was enabled by Python APIs and ELK stack for search on Azure Kubernetes Service for high scalability and administration.

5. Machine Learning is an OSS-only World

5.1 The Language of Choice is Open-Source

Python is the most favored language for Machine Learning (ML) development. With Python, one gets the double advantage of an open-source and redistributable programming language that can be used on Windows, Macintosh, Linux, Solaris, etc. These two factors ensure that the modules and the complete program are primarily portable and don't require modification to run on a system different from the one on which it was developed. Thereby, an ML development company saves time and cost of platform-specific programming, accelerating SDLC. Research in Machine Learning is primarily carried out using Python as it offers many community resources and packages. Moreover, Python being an open-source programming language has extensive documentation readily available on the internet. Even most of the alternative languages to Python (such as Java, R) are also open-source.

5.2   Frameworks of Choice are Open-Source

Organizations such as Google, Facebook, Uber, etc., have recently started to open-source and maintain their internal Machine Learning frameworks. Existing frameworks & libraries (TensorFlow, Theano, Caffe, Torch) are also open-source and fit the bill for ML development due to their ability to access, handle, and transform complex data in large volumes. Further, these open-source frameworks are most compatible with the open-source stack, mainly Python.

Due to the growing popularity of such frameworks & libraries, Python development companies are inspired to venture into Machine Learning. All the new frameworks are also primarily targeted to work on Python, which further fuels its popularity.

5.3   OSS Supported for Development in Most Cloud-based ML Services

The rise of OSS across the board, especially in the Machine Learning domain, has made cloud providers support OSS for development in ML services. Generally, a company will probably opt for the platform they've already chosen for their other cloud services (such as Azure, Google Cloud, or AWS) for ML services. However, if the company wants to avoid vendor lock-in when using a general-purpose service, it might prefer to go ahead with an open-source ML framework supported by all three vendors.

5.4   Cloud Allows the Machine Learning Models to be Deployed on a Scale

Deploying a machine learning (ML) model is gradually becoming easier, faster, and more accessible to everyone overall - thanks to the cloud. Cloud enables and makes it easier for enterprises to experiment with Machine Learning capabilities and scale-up. The major cloud providers offer devoted services for developing ML solutions, such as Microsoft's Azure Machine Learning, Amazon's AWS SageMaker, or Google Cloud AI Platform. These Cloud services allow Machine Learning developers to easily scale the trained ML models by providing the required compute resources on-demand to match their requirements. These services enable the management of the end-to-end machine learning lifecycle, by implementing MLOps to build, train and deploy models in automated pipelines. They also support popular frameworks & programming languages (such as Python, R, scikit-learn, XGBoost, Tensorflow, or PyTorch), smoothing the transition from working locally regardless of which tools one might be accustomed to. This enables individuals or organizations to gradually scale their models without worrying about the computing or taking the trained models out of the services they are trained for.

6. Future of Technology with OSS and Cloud

6.1 Next-gen Technology is OSS-dominated

Managed Open-source Cloud

OSS powers several next-generation tools, and "Managed" cloud implementation/services amplify their productivity by delegating management responsibilities & functions, saving costs, and improving operations. Managed Service Providers (MSPs) simplify migrating to a cloud platform and provide advanced technologies that help organizations move their cloud services to effective hybrid clouds. This facilitates organizations to make use of a range of applications and technologies continuously. MSPs enhance both top-and-bottom lines using multiple components such as asset and service management, business continuity, solution-based capacity management, and more.

Managed Container Orchestrations

Container orchestration automates the operations and tasks around deploying and running containerized applications & services, such as:
- Provisioning & deployment
- Configuration & scheduling
- Resource allocation
- Container availability
- Scaling or removing containers (based on balancing workloads)
- Load balancing & traffic routing
- Monitoring container health
- Configuring applications
- Securing interactions (between containers)

The latest IBM research reports that 70% of developers that use container orchestration solutions at their organizations have reported using a fully-managed/cloud-managed container orchestration service.

The advantages of managed container orchestrations are:
- **Simplified operations:** Containers introduce a large amount of complexity that can quickly get out of control without container orchestration to manage it.
- **Higher resilience:** Container orchestration tools can automatically restart or scale a container or cluster, thus boosting resilience.
- **Added security:** Container orchestration's automated approach helps keep containerized applications secure by reducing or eliminating the chance of human error.

Kubernetes Orchestration: The most popular container orchestration platform in recent times is Kubernetes. Almost all leading public cloud providers (such as Amazon Web Services, Google Cloud Platform, IBM Cloud, and Microsoft Azure) offer managed access Kubernetes services. Kubernetes, as a service on its own, has massively benefited from the managed implementations by cloud providers leading to the recent rise of this technology. In addition to enabling the automation fundamental to container orchestration, Kubernetes is considered highly declarative. Meaning, both developers & administrators can use it to essentially describe how they want a system to behave, and then Kubernetes executes that desired state in a dynamic manner.

Managed Blockchain Services

Consumers and businesses are now looking forward to adopting blockchain technology, but the technical complexities and operational overhead often act as barriers. Managed blockchain services eliminate the overhead required to create or join a public network and automatically scale to meet the demands.

Managed blockchain Services, also referred to as **Blockchain-as-a-service (BaaS),** is third-party cloud-based infrastructure & management for companies building and operating blockchain apps. BaaS allows customers to leverage cloud-based solutions to create, host, and use their blockchain apps and related functions. The cloud-based service provider, at the same time, helps to keep the infrastructure agile & operational. Further, BaaS is seen as the catalyst promoting the adoption of blockchain technology across businesses.

Major players in the BaaS space (Amazon and Microsoft Azure):
- **Azure Blockchain Service** is a fully managed service designed to eliminate the complexity and pain points of creating and maintaining blockchain networks at scale.

- **Azure Workbench** is built on a predefined template on Ethereum Protocol, and it provides access to client apps to create & manage users and blockchain applications.
- **Amazon Managed Blockchain** is also a fully managed service that makes joining public networks easy or creating and managing scalable private networks easier using the popular open-source frameworks Hyperledger Fabric and Ethereum.

6.2 Industry 4.0

Industry 4.0 (Fourth Industrial Revolution - 4IR) in the 21st century conceptualizes the rapid changes in technology, industries, societal patterns, and processes. Increasing interconnectivity and smart automation have made these transitions not just efficient but express a significant shift in industrial capitalism. This phase of industrial change is similar to joining several advanced technologies (such as Gene Editing, Digital Twining, and Information Technology) powered by IoT, Artificial Intelligence, Machine Learning, and Big Data Analytics to Advanced Robotics. These advanced technologies have blurred the lines between the physical, digital, and biological worlds.
However, some organizations still argue and deny that Industry 4.0 has introduced revolutionary changes, and it could impact their businesses. While some organizations are struggling hard to find out how to best adapt, a few others are implementing changes today and preparing for the future where smart machines improve their business. Open-Source Software (OSS) and Public Cloud Platforms have laid the foundation stones for radical changes in the industry. Data and Insights are the most critical components of any enterprise workload, and Microsoft Azure cloud-based technology & services, along with support for OSS, can deliver the demand for intelligent insights.

6.3 Metaverse

The Metaverse Project is open-source, modular, flexible, and extensible. Open-Source Metaverse Project was built to fulfill the demand and prominent developer-following for virtual worlds that allow customization and creation of one's worlds. Although closed source virtual worlds already exist (*Second Life*, *There*, and *Active Worlds*), there was a requirement for a metaverse engine that is flexible, scalable, and can be customized, which is not possible within individual proprietary worlds. The following key points are worth mentioning in this context:
- The alternative universe gives an immersive experience to work, shop, learn, etc., with digital avatars
- Metaverse projects are built using open-source stacks and use Cloud platforms as the backbone
- Existing technology in Machine Learning is heavily used to power the Metaverse elements
- Open-source projects are also in development to rival projects by commercial organizations.

6.4 Emerging Technologies

Non-fungible Tokens (NFT), Quantum ML, Sovereign Cloud, Data Fabric, Generative AI, Homomorphic Encryption, and Composable Applications & Networks are among the key technologies to watch out for, according to Gartner. Engineering trust, accelerating growth & sculpting change are the overarching trends on the Gartner Inc., Hype Cycle for Emerging Technologies, 2021 (see figure below). These three trends will drive organizations to explore emerging technologies to secure a competitive advantage.

The Hype Cycle for Emerging Technologies promises to deliver a high degree of competitive advantage over the next 5 to 10 years.
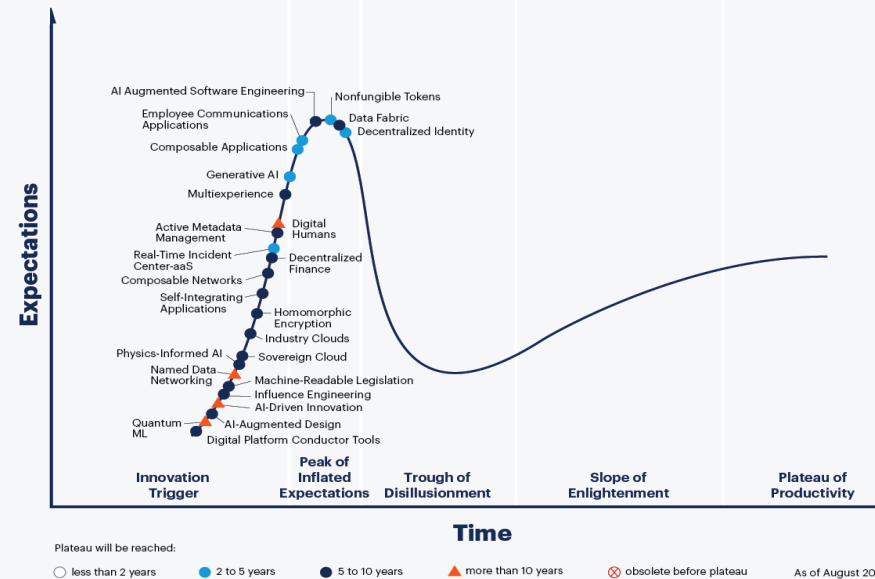
Gartner's Themes of Emerging Technology Trends:

Engineering Trust: Apart from the security and reliability that trust demands, it can build innovations as a resilient core and foundation to deliver business values. To engineer trust, the emerging technologies are to be watched out for.

Accelerating Growth: Organizations should balance both technology and business risk to ensure that the near-term objectives are achievable. Once the innovation-led core is scaling, accelerated growth extends delivery and value. To accelerate growth, technologies such as multi-experience, industry cloud, AI-driven innovation, Quantum ML, Generative AI, and Digital humans should be explored.

Sculpting Change: Organizations can use innovations to sculpt change, bring order to chaos, and auto-tune to changing needs. Organizations looking to sculpt change should consider technologies such as Composable applications & networks, AI-augmented design, AI-augmented software engineering, physics-informed AI, influence engineering, digital platform conductor tools, named data networking, and self-integrating applications. Cloud and Open-Source Software will soon form the backbone for realizing these emerging technologies.

Conclusion

As prominent vendors continue investing in open-source software, many businesses are now shifting to open source as it is driving business growth. Further, open-source projects being modularly architected provide both the flexibility and the robustness of the code. The worldwide open-source community, however, does not provide direct support for individual businesses using this technology. Although there are forums and online guides, sometimes a business might have a problem that isn't easy to resolve, and a managed open-source can help here.

Businesses worldwide now realize how OSS on Cloud can help them, and if your business hasn't considered open-source before, it is time to do so.

Companies such as Microsoft attribute the increased adoption of their software development platform to open source and cross-platform support. LTI has imbibed "OSS on Azure" as a dedicated practice to traverse the path that Microsoft has taken with Open-Source adoption in Azure. LTI provides solutions aligned with the advancements in containers with AKS and OSS-driven transformation of AI/ML/DS workloads by leveraging Microsoft's expertise in these domains. LTI is a trusted and globally-recognized Microsoft Partner. LTI has a long-standing 360° partnership with Microsoft as a Strategic Partner, Vendor and Customer. As a Partner, LTI has made significant investments with Microsoft over the years in building capability, as well as to co-create joint offerings and solutions for our customers.