

# Enabling Generative AI for Life Sciences and Healthcare Customers using the Power of Cloud

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**Abstract:** *Generative AI is enabled using Large Language Models (LLMs) and advanced machine learning to create human-like text or imagery, pulling from existing data and experiences to generate new content. Generative AI can enhance how humans traditionally perform daily tasks and work across industries. Pharma companies employing AI-powered tools go beyond what existing probabilistic models are capable of. Microsoft Cloud, AWS Cloud and Google Cloud are helping Life Sciences and Healthcare Customers harness the power of Generative AI (GenAI) and high-performance computing (HPC) to define the future.*

**Keywords:** Generative AI, Large Language Models, Foundation Models, Model Based Definition, AI/ML, Cloud Generative AI Services, AWS, Microsoft Cloud, Google Cloud

Top 3 key Generative AI trends which can transform Life Sciences organizations are listed below. Generative AI has become from need to necessity for the Pharma and Healthcare organizations.

<b>Drug Discovery</b> Generative AI can accelerate drug discovery by generating new molecules with specific properties.	<b>Drug Design</b> Generative AI can be used to design new drugs by generating molecular structures that are optimized for specific properties.	<b>Clinical Trials</b> Generative AI can optimize clinical trials by identifying patient subgroups likely to respond to a particular treatment.
<b>What are the challenges of Generative AI in Pharmaceuticals &amp; Healthcare Industry?</b>		
<b>Data Quality</b> One of the prominent challenges is the quality of data used to train the Generative AI models. Poor quality data can lead to incorrect models and inaccurate predictions.	<b>Interpretability and Explainability</b> Generative AI models often operate as black boxes, making it hard to interpret and explain the underlying decision-making process. In the pharmaceutical industry, where transparency and interpretability are crucial for regulatory approvals and ethical considerations, ensuring transparency can be challenging.	
<b>Regulatory Compliance</b> Pharmaceuticals are subject to strict regulations, and any new technology must comply. The use of Generative AI in pharmaceuticals may require regulatory approval, which can be a time-consuming and costly process.	<b>Validation and Accuracy</b> Generative AI models' accuracy and reliability must be rigorously validated before deploying them for critical pharmaceutical tasks. Establishing robust validation methodologies specific to the pharmaceutical domain can be complex and time-consuming.	
<b>Ethical Concerns</b> As with any technology, Generative AI raises ethical concerns. One concern is the potential misuse of Generative AI to create new drugs without proper testing and evaluation. Another drawback is the use of Generative AI to create drugs that are only effective for specific demographics, which can lead to inequality in access to healthcare.	<b>Integration with Existing Systems</b> Generative AI must be integrated with existing systems in pharmaceuticals & healthcare, which can be a challenge due to the complexity of these systems. Additionally, pharmaceutical and healthcare companies may need to invest in new hardware and software to support the use of Generative AI.	
<b>Intellectual Property Rights</b> Generative AI in pharmaceuticals raises questions about who owns the intellectual property of drugs created through this technology.		

## Usage of Generative AI in Pharma and Healthcare Industry

**Use in Drug Discovery**

Generative AI can play a significant role in the drug discovery and development process. It can help with the designing of new molecules/antibodies that can be suitable for a particular target.

Generative AI can be used for the creation of synthetic datasets and digital twins for virtual trials & simulations and synthetic control arms for clinical trials.

Insilco Medicine's Chemistry 42 platform based on Generative AI could design and validate a molecule in 45 days. AbSci uses a Generative AI platform – Zero Shot to design monoclonal antibodies which are effective in various therapy areas.

**Personalized Medicine**

Generative AI can potentially help with creating personalized treatment plans based on disease history, patient history, and other factors. The solutions for this are currently still in the experimental stage with no real-world models as of now.

**Creation of Prosthesis**

Like drug designing, Generative AI can be used for prosthesis designing. These prostheses will fit better for the patients since it was customized for them in particular. An Indian-based company called ALIMCO is using Generative AI (Avocado) for designing prostheses for limb amputees.

**Medical Imaging**

Generative AI can be used for the reconstruction of an image by removal of artifacts and using parts of the information provided by different types of imaging modalities which will help in better diagnosis and understanding of the disease states. Subtle Medical provides solutions in image enhancement using Generative AI to multiple companies.

**Treatment Aids**

Organizations are testing Generative AI-based products that can treat patients with hearing loss, vision loss, etc. Such products help reduce noise and enhance voice/images & the important parts, which can assist patients with their respective diseases. Currently, these are in the early development stage.

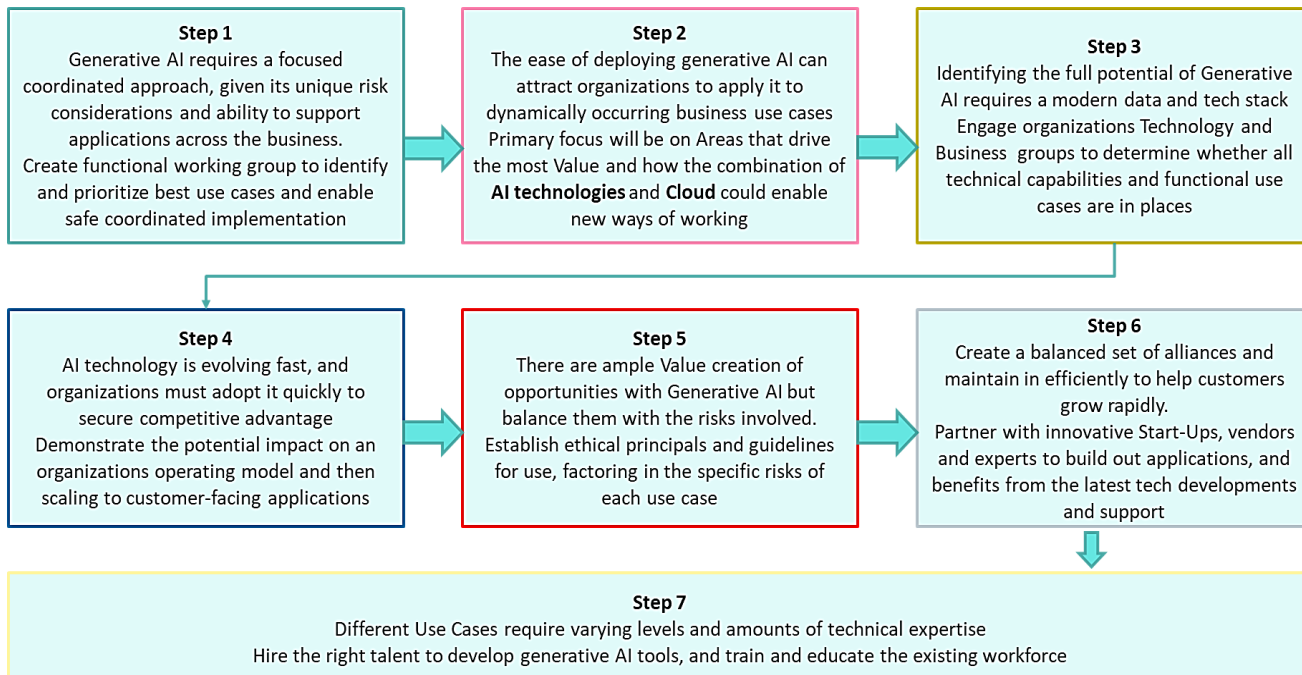
**Synthetic Data Set Creation**

Due to the unavailability of sufficient data sets, it becomes difficult for organizations to train AI models. Synthetic datasets are created using the available information (clinical data, genotypic, phenotypic, molecular, etc.) which can be used to train the AI. Gretel, a Generative AI organization, used real genotype and phenotype data to generate artificial genomic datasets, which were used by Illumina.

**Approach to Adopt Generative AI**

Enterprises should adopt Generative AI in a focused, incremental, and structured approach. Specially the Pharma customers should be aware about all the risks related to Regulatory & Compliances. Idea is to start with small

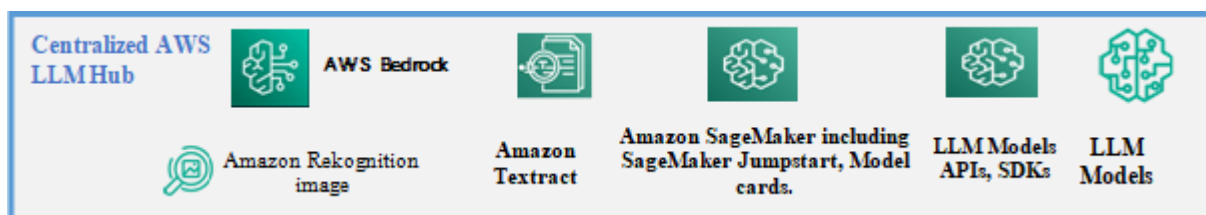
projects or use cases and then grow steadily in a structured and efficient way. This will not only allow organizations to innovate better but also avoid and failures and learn from initial projects, identify the impact of the technology, and work in more agile manner.



The adoption of generative AI requires an increased data usage and greater consumption of infrastructure resources, besides scalability, availability of pre-trained models and

ease of integration into current applications which makes it mandatory to leverage the cloud for generative AI.

**AWS Generative AI Services:**



Generative AI on AWS can create entirely new experience for Life Sciences and Healthcare customers, drive unprecedented levels of productivity, and help transform

business. Below are range of popular AWS services that have generative AI built-in and can be used to implement the right use cases with developer friendly configurations



**Amazon Bedrock:** The easiest way to build and scale generative AI applications with foundation models (FMs)

**Amazon Elastic Compute Cloud (EC2) Trn1 instance** deploys up to 16 AWS Trainium accelerators to deliver a high-performance, low-cost solution for deep learning (DL)

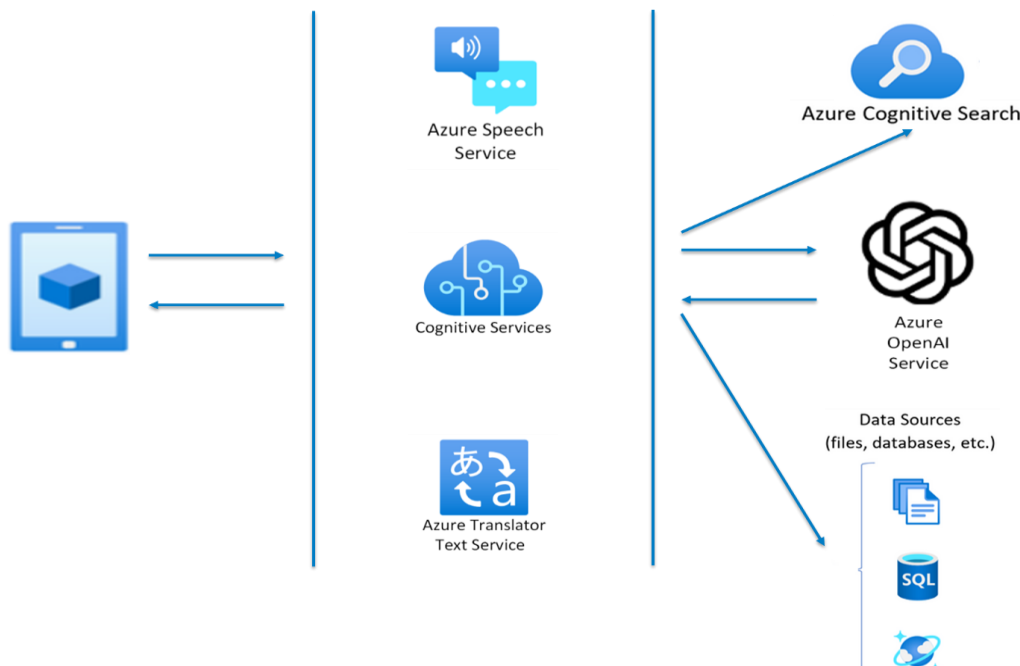
**AWS Inferentia:** Accelerators are designed by AWS to deliver high performance at the lowest cost for your deep learning (DL) inference applications.

**Amazon HealthScribe:** Automatically generate clinical notes from patient-clinician conversations.

**Amazon SageMaker:** Build, train, and deploy machine learning (ML) models for any use case with fully managed infrastructure, tools, and workflows.

**Microsoft Cloud Generative AI Services:** Generative AI on Microsoft Cloud can be used for Life Sciences and Healthcare customers, drive unprecedented levels of productivity, and help transform business. Below are range of popular Microsoft Cloud services that haveGenerative AI capabilities.

**Amazon CodeWhisperer:** Build applications faster and more securely with your AI coding companion.



**Microsoft Cloud Cognitive Search and OpenAI Service** in combination yields an effective solution for LifeSciences and Healthcare Industry Use Cases scenarios. It integrates the enterprise-grade characteristics of Microsoft Cloud, the ability of Cognitive Search to index, understand and retrieve the right pieces of your own data across large knowledge bases.

Whereas **ChatGPT** has extensive capability to interact in natural language to answer questions or take turns in a conversation.

**Large language models** of ChatGPT are using natural language, giving the model a prompt, and requesting it to complete it or building an application where users should see responses based on their own data.

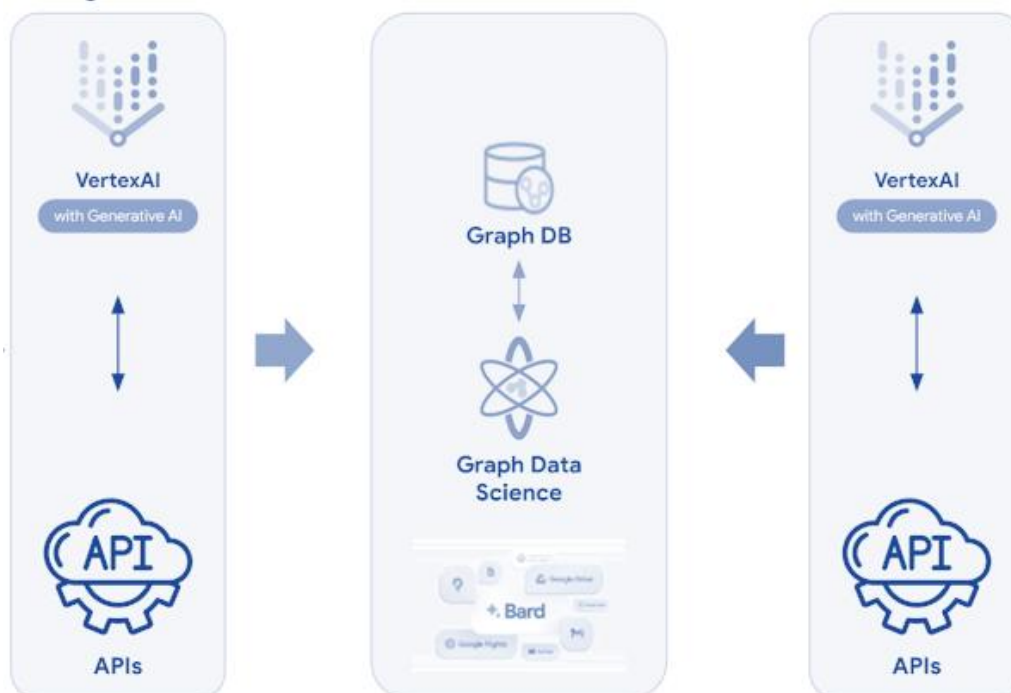
- Microsoft Azure Cloud OpenAI Service provides REST API access to OpenAI's powerful language models

including the GPT-3, Codex and Embeddings model series, the new GPT-4 and ChatGPT (gpt-35-turbo) model series.

- These models can be easily adapted to Life Science and Healthcare Use Case specific tasks including content generation, summarization, semantic search, and natural language to code translation.
- Users can access the service through REST APIs, Python SDK, or our web-based interface in the Azure OpenAI Studio.

**Google Cloud Generative AI**

The Bard AI system is work on based on Google's **LaMDA** innovation. **LaMDA**, or Language Model for Dialogue Applications, gathers information from the internet and generates responses to inquiries that resemble human speech.





**Google Vertex AI** is a robust and integrated machine learning (ML) platform, made available via Google Cloud. Vertex AI provides some of the key offerings of an efficient and scalable method for creating, deploying, and managing ML models. To streamline the entire ML Vertex AI brings together a variety of ML tools and services.

- AutoML capabilities of Vertex AI lets users create unique ML models with almost no coding, which allows the platform to a larger spectrum of users.
- Vertex AI also offers an efficient platform for distributed training and hyperparameter tuning.

**Google Bard** on the other hand is an AI Chatbot developed by Google and is based on Google's Large language model (LLM), **LaMDA**. Google Bard is conversational and allows users to write a prompt and receive human-like text and images generated by AI. Google Bard has the potential to use up-to-date information for its responses and can freely search the internet to get related searches directly from Google.

Google has recently launched a medical large language model, or LLM, called **Med-PaLM 2**. Med-PaLM 2 harnesses the power of Google's LLMs, aligned to the medical domain to answer medical questions more accurately and safely.

## Conclusion

This paper describes how Cloud Service Providers are restructuring themselves to enable Generative AI Use Cases for Life Sciences and Healthcare Customers. Generative AI capabilities are driving process efficiencies, reducing redundancies, using enterprise data more effectively, and, ultimately, streamlining the end-to-end value chain for Life Sciences and Healthcare Customers. Cloud Service Providers, however, are working towards creating services which can empower vendors, partners, and customers to adopt AI (in particular Generative AI) in more efficient and powerful way. As per recent survey by McKinsey **"Generative AI's impact on productivity could add trillions of dollars in value to the global economy."** And early adopters will benefit and make a big impact.

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