



Generative AI: The New Age of Artificial Intelligence

Understanding the Technology, its Applications, and Implications for Businesses

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Introduction

Artificial Intelligence (AI), the biggest revolution of the past few decades, has changed how we live, work, and interact with technology. At its core, AI aims to mimic human intelligence and perform tasks such as speech recognition and language translation, which previously only humans could perform and typically require cognitive abilities such as reasoning and learning from past experiences. AI has advanced rapidly in recent years with continuous advances in Machine Learning (ML), Deep Learning (DL), Natural Language Processing (NLP), among other areas. However, there is one area in which traditional AI has fallen short – displaying human creativity and creating new and unique content such as creative writing, music, and art. But the advent of generative AI is changing that.

Generative AI can create new and unique content in the form of text, images, videos, audio, code, and more. One of the most noteworthy demonstrations of generative AI – which has taken the world by storm – is ChatGPT, a very advanced chatbot launched by OpenAI, an AI research and development company located in San Francisco, California. Based on a text prompt, ChatGPT can create all kinds of text outputs – articles, blogs, code, job descriptions, and more – that are very difficult to distinguish from the human-generated text.

Generative AI has garnered a lot of interest from the huge tech firms. Microsoft has integrated ChatGPT with Bing and Microsoft 365, offering users an innovative search and productivity experience. Google has launched its own chatbot – Bard – and introduced a range of generative AI-enabled tools, including the generative AI-powered Google Workspace and Vertex AI, a low-code MakerSuite Service for prototyping ideas for building generative AI applications, and Generative AI App Builder for building chatbots, search engines, and digital assistants.

Generative AI could also revolutionize the Intelligent Automation (IA) space, hugely increasing automation potential for organizations. Until now, IA has largely been focused on automating manual and routine tasks through rule-based automation technologies such as attended and unattended Robotic Process Automation (RPA), and AI-based automation through Intelligent Document Processing (IDP) and conversational AI. Generative AI is essentially a whole new category in the IA space, with the capability to apply higher intelligence and enable enterprises to automate creative tasks as well.

In this viewpoint, we help enterprises and providers understand generative AI technology thoroughly and its impact on their businesses; specifically, we discuss:

- The meaning and current landscape of generative AI, including tools/products available in the market and underlying machine learning models
- Use cases of generative AI and potential benefits
- Implications of generative AI on enterprises, technology providers, and service providers
- Current challenges and best practices for successful implementation of generative AI

Generative AI – meaning and current landscape

Generative AI is a relatively new form of AI in which the underlying ML models are trained on huge datasets using unsupervised and semi-supervised learning. The models can generate new content in the form of text, images, videos, audio, code snippets, and more.

Very large training datasets are critical to the success of generative AI. For instance, ChatGPT is built on GPT-3, the third generation of OpenAI's family of Large Language Models (LLMs), which are trained on huge amounts of text data. In general, the more parameters a model has, the more data is required to train the model – GPT-3 is a model with over 175 billion parameters; by comparison, the largest trained language model before GPT-3 was Microsoft's Turing Natural Language Generation (NLG) model, which had 17 billion parameters. DALL ·E 2, an AI system that can create realistic images and art from a description in natural language, is trained on upwards of 650 million images. This vast amount of data enables these tools to generate high-quality and unique content.

The latest addition to the generative AI space is GPT-4, which represents a major leap forward. It boasts of multi-modality, which means – unlike ChatGPT and other text generation generative AI tools – it can take non-text formats, mainly images, as inputs and produce high-quality outputs.

Generative AI tools

There are several generative AI tools available in the market with varied applications, such as generating human-like text in the form of articles and blogs, realistic digital images and art, videos, 3D assets, and more. The table below provides details on the most common applications of these tools.

Application	Description
generation	 Generates human-like text based on prompts provided in natural language, such as: "Write a product description for a sneaker with the brand name Elite. Keywords: teenagers, stylish, affordable"
	 Can draft articles, marketing copy, code, emails, etc. Can also summarize, translate, and elaborate pieces of text
Image	 Generates realistic digital images and art based on text prompts
generation	 Can perform image-to-image conversion tasks such as sketch-to-image translation, style transfer, erasing parts from an image, resolution improvement, inpainting, and outpainting
Video generation	Generates long-form videos with automatic subtitles and customizable sounds given a script/blog link
Audio generation	Generates new, and edits existing, sound/music based on text prompts, such as ringing church bells, artist, tempo, and duration

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Application		Description
Ξ	Image captioning	Writes descriptions/captions for images
	Code generation	Converts natural-language prompts to code and offers code suggestions; translates code across programming languages such as Python, Java, and PHP; and, debugs code
	Synthetic data generation	Generates multiple sample datasets given an existing dataset as an input, particularly useful in situations when obtaining a significant amount of real data for training ML models is difficult because of privacy and/or cost concerns, such as in the healthcare industry
, , , ,	3D assets generation	Converts text and 2D image prompts to 3D visualizationsCan also do human motion generation based on a text prompt

Exhibit 1 provides a few examples of generative AI tools available in the market for the applications listed above.

EXHIBIT 1

Examples of generative AI tools by application

Source: Everest Group (2023)

Arranged alphabetically

Text generation	🚳 ChatGPT COPY.ai 🔾 Jasper 🔌 Simplified 🔤 Writesonic
Image generation	DALL-E 2 🔾 Jasper Art Millouncer 🕞 runway Stable Diffusion
Video generation	🛟 Fliki Kaiber 🔇 Iumen5 🧟 PICTORY 🔇 synthesia
Audio generation	Aiva Jukebox MuseNet VOCALOID
Image captioning	Azure Cognitive Services: Computer Vision
Code generation	🌀 ChatGPT 🖻 cogram 🕀 GitHub Copilot 🛛 PolyCoder 💿 tabnine
Synthetic data generation	gretel hazy MDCLONE MOSTLY AI 🤿 SYNTHESIZED
3D assets generation	DreamFusion GET3D MDM: Human Motion Diffusion Model 🌀 Point-E

Enterprises and providers are showing significant interest in ChatGPT, DALL·E 2, and GitHub Copilot because of their advanced capabilities. GPT-3, upon which ChatGPT is built, is also a foundational model for many other generative AI tools such as Copy.ai, Jasper, Writesonic, and DALL·E 2.

These tools are developed using several ML models such as transformer models, Generative Adversarial Networks (GANs), and diffusion models

- **Transformer models** are deep learning models used to build LLMs such as GPT-3 to produce human-like text by adopting a self-attention mechanism that processes the entire input at once and focuses on those parts of the input that are most relevant for generating output. Some tools deploying transformer models include ChatGPT, Copy.ai, and DALL·E 2.
- Generative Adversarial Networks (GANs) contain two parts: generator and discriminator. The generator generates new content, such as images based on the training data, and the discriminator distinguishes between real and fake images. Both networks keep improving over time and so does the performance of the tools built using GANs. Synthetic data generation tools, such as Gretel and Hazy, leverage GANs in their architecture.
- Variational Autoencoders (VAEs) have two neural networks: encoder and decoder. The
 encoder converts the input into a latent code, which is a vector of numbers representing different
 components of the input. The decoder takes the latent code as input and generates an output
 (such as text or image) that matches the input prompt. OpenAl Jukebox for audio generation is
 built using VAEs.
- Diffusion models have emerged recently, specifically to improve image synthesis over GANs and VAEs. In diffusion models, when given a prompt, the generator keeps adding Gaussian noise to the training data, generates a blurred image, then reverses this noising process and generates high-resolution realistic images. Diffusion models are used to build image generation tools such as DALL·E 2, Midjourney, and Stable Diffusion.

A big reason for ChatGPT's success is GPT-3, a large language model with more than **175 billion parameters**, which dwarfs the previous largest model, Microsoft's Turing Natural Language Generation (NLG) model, with 17 billion parameters.

Generative AI use cases and potential benefits

There are several ways enterprises can use generative AI across industry-specific and horizontal processes. For example, in banking, generative AI can be applied to industry-specific processes such as credit evaluation and account maintenance, and horizontal processes such as hire-to-retire and accounts payable. The exhibit below offers an illustrative list of use cases as well as a few sample outputs of generative AI tools.

EXHIBIT 2

Use cases and sample outputs

Source: Everest Group (2023)

Industry-specific use cases

Industry	Use cases	Generation of
BFSI	Providing information on various accounting standards and tax laws to assist with tax auditing to comply with financial regulations	Text
	Generating synthetic data to increase the fraudulent data points in training data to improve the performance of ML-based fraud detection models	Text and synthetic data
	Using synthetic data to help train ML models used for KYC processes	Text and synthetic data
Healthcare	 Generating medical reports and automatically approving claims Aiding medical professionals by generating insights from medical scans and patient test results 	Text, image, and image captions
\bigcirc	Understanding the current state of medical ailments and probable future mutations to speed drug discovery	Text, image, synthetic data, and 3D assets
	Aiding with design and rendering prosthetics from simple sketches and data	Image, image captions, video, and 3d assets
CPG & retail	Generating insights around current market trends, challenges, and customer preferences	Text
	Analyzing sales trends and other market parameters to forecast demand and provide insights on inventory management, trade promotions, and offers, and present them in a report format	Text and synthetic data
Media	Assisting content creators in producing new and editing existing media content, including articles, music, and movies, from prompts such as texts and sketches	Text, image, audio, video, and 3D assets
	Generating correct translations and generate subtitles between languages	Text and audio
	Synthesizing 3D virtual models to drastically reduce costs and implementation time to aid in the metaverse and creating video games	Text, image, video, and 3D assets
Government and public	Combining multiple generative AI technologies to make education and clarifications accessible to students across a wide range of economic and linguistic backgrounds	Text, image captions, and audio
sector	Analyzing per capita income, purchasing power parity, wealth distribution, subsidies, and other government policies to aid in budget preparation	Text and synthetic data
	Generating synthetic data to better predict traffic and improve disaster response planning	Synthetic data
Manufacturing	Combining multiple generative AI technologies to convert brief product descriptions through text prompts and sketches to synthesize engineering design diagrams, speeding development	Text, image, and image captions
	Designing new materials with the desired properties using generative AI by training it with large datasets on material alloys, properties, and use cases	Synthetic data and 3D assets generation
	Aiding with design and rendering prosthetics from simple sketches and data	Image, image captions, video, and 3D assets
Technology	Summarizing elaborative product program codes to generate output in text format for use in creating compelling executive pitches for management	Text and code
	Increasing coding efficiency by aiding in code creation, code completion, and the testing to find bugs	Code snippets

EXHIBIT 2 (continued)

Use cases and sample outputs

Source: Everest Group (2023)

Business function or horizontal use cases

Business function	Use cases	Generation of
Finance & accounting	Enhancing processes such as invoice processing by improving accuracy to lower processing times	Text and image captions
	Generating financial reports and providing insights by summarizing key points, figures, and financial ratios	Text
Sales & marketing	Writing unique product descriptions, product guides, landing pages, blogs, ad copy, etc.	Text, image, audio, and video
	Identifying buyer personas and creating an end-to-end customer journey map to improve the brand image and generating marketing content for each customer segment	Text, image, audio, video, and synthetic data
	Optimizing SEO by generating metadata and target keywords	Text
Contact center	Combining multiple generative AI technologies to develop advanced chatbots that can handle human-like conversations with enhanced capabilities such as multimodal support and agent assist	Text, audio, and video
	Synthesizing additional training data in newer process areas and industries in which data is scarce	Text and synthetic data
	 Training human agents with generative AI to improve their oral communication Enabling communication across different languages 	Text, audio, and video
HR {@}}	Writing job descriptions using generative AIs with brief text descriptions about the job and job requirements	Text
	Leveraging generative AI to shortlist candidates based on their resumes and automatically scheduling interviews	Text
	Creating performance management and customized training and development for employees	Text
Legal	Generating, reviewing, or summarizing legal documents such as contracts, agreements, and policies	Text
	Assisting in legal research by generating insights about the latest laws and regulations and best practices for regulatory compliance	Text

EXHIBIT 2 (continued) Use cases and sample outputs Source: Everest Group (2023)

Sample outputs

Generative AI | use case samples

Text generation

Prompt: I have a men's grooming products D2C business. Write a short-personalized email for a customer who hasn't shopped in a long time. Customer Name: Karan

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ChatGPT¹

Subject: We miss you, Karan!

Dear Karan,

We've missed you! It's been a while since you last shopped with us and we wanted to check in and offer a special discount code for your next purchase. Use code WELCOMEBACK at checkout to receive 10% off your order.

We've added new products to our men's grooming line since your last visit, so there's plenty to explore. We hope you'll give us the opportunity to earn your business again.

If you have any questions or feedback, please don't hesitate to reach out.

Best regards,

[Your name]

[Your business name]



Subject: We Miss You, Karan!

Dear Karan,

We hope this email finds you well. We noticed that it's been a while since you last shopped at [Your Business Name]. We miss you and we'd love to have you back!

We know that life can get busy, but don't forget to take care of yourself. Our men's grooming products are designed to make your self-care routine easy and effective.

As a valued customer, we want to offer you a special discount of 15% off your next purchase. Just use the code WELCOME15 at checkout.

Thank you for considering our products and we hope to see you soon!

Best. [Your Business Name]

Generative AI | use case samples

Code generation

Prompt: generate a python code that implements the insertion sort algorithm



```
def insertion_sort(array):
  for i in range(1, len(array)):
     key = array[i]
    j=i-1
     while j >= 0 and key < array[j]:
       array[j+1] = array[j]
       j -= 1
     array[j+1] = key
  return array
```

array = [5, 2, 8, 4, 7, 1, 3, 6] sorted array = insertion sort(array) print(sorted array)

Source: OpenAl

Source: Writesonic

EXHIBIT 2 (continued) Use cases and sample outputs Source: Everest Group (2023)

Sample outputs

Generative AI | use case samples

Image generation

Prompt: a 3D render of a rainbow-colored hot air balloon flying above a reflective lake





 \mathbf{R} runway²

Benefits of generative AI

The varied applications and uses of generative AI can yield significant benefits for enterprises, particularly in increasing employee productivity, enhancing customer experience, and reducing costs, as elaborated below.

- Increase employee productivity: Generative AI can help automate various mundane and routine tasks such as:
 - Producing stakeholder reports and leadership dashboards
 - Conceptualizing rich user experience walkthroughs
 - Creating user-friendly product documentation, such as reference guides
 - Assigning tasks such as taking meeting notes and creating action points

These automations are likely to increase FTE capacity, that employees can use to focus on more high-value tasks, such as R&D, product development and innovation, and understanding customer pain points, which may increase job satisfaction and retention.

2 Source: Runway

- Enhance customer experience: Generative AI can help enterprises deliver more personalized experiences to customers, increasing customer satisfaction and retention. By enhancing currently used tools' capabilities for customer support such as chatbots and voice IVRs, generative AI can offer personalized product recommendations and speed query resolution, providing customers a more human-like experience.
- **Reduce cost:** Generative AI tools can create significant cost savings for enterprises by automating tasks currently done by humans such as content creation, customer support, and data gathering. Furthermore, integrating ChatGPT with conversational AI solutions can enable chatbots and voice IVRs to handle more complex customer queries, reducing agent costs.
- Increase top-line growth: Generative AI can help automatically generate more targeted and personalized content, such as emails and notifications, to reach out to the customers, generate leads, create cross-sell and upsell opportunities, and contribute more revenue to an organization.

Implications of generative AI

For enterprises

As discussed above, generative AI is an emerging technology that has the potential to revolutionize the way businesses operate. It uses ML and deep learning algorithms to generate new and unique outputs, such as text, images, or even music, based on a set of inputs and a trained model. Recent advances in this field have paved the way for the creation of new use cases and solutions that can increase the benefit potential for enterprises. However, as with any new technology, there are potential implications and consequences that businesses must consider.

Impact on automation and AI strategy

- Process automation: The impact of generative AI on enterprise automation and AI strategy can be significant, as it helps augment existing solutions, thereby providing new opportunities for automating tasks that were previously difficult. For example, with the integration of ChatGPT (a generative AI tool) with conversational AI, the resulting chatbot is likely to handle tasks such as information retrieval more efficiently, thereby increasing the automation rate. Additionally, organizations can use generative AI to create synthetic data to train and test AI models, further enhancing their efficacy and enabling more intelligent automated systems. Therefore, enterprises need to reevaluate their automation requirements with generative AI in mind, given the likely possibility of achieving better outcomes with its use.
- Impact on sourcing strategy: Enterprises need to consider a sourcing strategy that encompasses factors such as talent, technology knowledge with customization capabilities, business acumen, and change management. Generative AI has important implications, especially in terms of partnering with technology and service providers. Enterprises should look for providers that have reliable AI experts with specialized skills in generative AI. While technology providers are critical to enabling access to the latest advances, service providers can bring to the table process knowledge, implementation expertise, and change management capabilities. Enterprises should leverage the partnerships as early as possible – from use case identification to performance monitoring – while developing internal expertise in parallel.

Impact on talent strategy

Generative AI can automate many tasks that humans currently perform, which may lead to job losses in some industries such as IT & engineering (coders, testers, etc.), legal (paralegals, etc.), and media (advertising, content creation, etc.). Employees need to reskill or upskill to stay relevant in the job market; one way to do so could be to leverage the insights provided by generative AI to perform higher-order/strategic work. On the other hand, generative AI will create new job opportunities in fields such as data science, AI/ML development, and prompt engineering. Enterprises need to develop new, or update existing, talent strategies, including investing in training and development programs, to manage this disruption and ensure that their employees have the skills they need to thrive in the new AI-driven workplace.

Generative AI has the potential to fundamentally change the way employees work; consequently, enterprises that are proactive in developing/updating their talent strategies will be well-positioned to succeed in the AI-driven economy.

For providers

Enterprises are likely to rely on technology and service providers to manage some aspects of generative AI for them. Providers will need to build and demonstrate credibility in this space to cater to market requirements. At the same time, they need to manage the impacts of this technology on their own organizations. Following are some high-level implications of generative AI for technology and service providers.

- Automation: Generative AI can help automate routine service delivery tasks, freeing human agents to focus on more complex or high-value activities.
- Regulation: The regulatory landscape for AI in general is evolving, and providers need to be aware of relevant guidelines to ensure that their products comply with these regulations. Specifically in the case of generative AI, robust regulations are not yet in place; for instance, there still exist unanswered questions around who owns the Intellectual Property (IP) for the outputs.
- Integration: Providers can use generative AI tools, such as ChatGPT as-is or customize them to integrate with other IA technologies such as RPA, process mining, IDP, and conversational AI, to enhance their offerings.
- **Performance enhancement:** Given that generative AI tools are already trained on a large amount of data, some additional contextual training or fine-tuning of the model can produce high-quality outputs leading to improved accuracy of tasks such as text or conversation summarization. This capability has the potential to further help improve automation metrics such as Straight Through Processing (STP) rate, Turnaround Time (TAT), and Average Handling Time (AHT).
- Emergence of new competitors / business models: Generative AI is evolving, and there is a lot of interest from new providers to build and market their capabilities. Incumbent providers are under pressure to reduce their time to market, but they need to be cautious about potential pitfalls such as launching a faulty or inadequate product.

Contextual training or fine-tuning of generative AI models can generate high-quality outputs and has the potential to improve automation metrics such as **Straight Through Processing (STP) rate, Turnaround Time (TAT), and Average Handling Time (AHT).**

Current challenges with generative AI and best practices for successful implementation

Challenges that enterprises and providers might face when adopting generative AI

Generative AI comes with advanced capabilities, and its potential use cases across different industries and business functions are growing every day. However, enterprises should be aware of the challenges it currently poses so that they can be prepared to address them.

- Lack of context-specific data: Generative AI, like any other form of AI, requires reliable data to generate accurate content. In its absence, generative AI tends to create incorrect or undesirable results.
- **Tendency for bias:** Although training data may be carefully curated to ensure it is diverse, inclusive, and free from discriminatory biases, there is room for hidden biases in the data, as they reflect our society. Because generative AI works by finding patterns in training data, it could generate similarly biased content.
- **Overfitting with the training data**: Extensive training of a generative AI model with limited datasets could lead to scenarios in which it force-fits patterns generated from existing data, creating inaccurate results.
- Lack of explainability: Current generative AI tools do not provide out-of-the-box confidence scores for their outputs, leading to lingering enterprise apprehension and mistrust.
- Lack of accountability: Generative AI can raise issues of accountability if they make a mistake or generate inaccurate information. Unlike humans, these generative AI tools cannot be held accountable for their actions; consequently, any negative outcome can harm the provider's reputation and damage customer trust.
- Lack of skilled talent: There is a high demand for Al talent, but not corresponding supply. Both attraction and retention of this scarce talent are major challenges enterprises and providers face.

- Ethical concerns: Sometimes AI models can provide logically incorrect output that sounds true at the first glance, potentially leading to the spread of misinformation, which can be used to manipulate public opinion, such as manipulating online reviews by posting large numbers of human-sounding generated reviews.
- Data privacy and security concerns: The data used to train the generative AI models might contain sensitive information, resulting in the risk of data breaches or data misuse. Further, many generative AI constructs cannot be brought on-premises or into an enterprise firewall and many of them store prompts and results as well; therefore, enterprises run the risk of exposing proprietary/internal code or information when employees use generative AI tools without following appropriate guidelines.
- Sustainability concerns: Generative AI consumes a lot of processing power to produce outputs such as images or videos, which will likely increase enterprises' carbon footprints.

Key success factors to achieve superior business outcomes

To successfully implement generative AI while navigating challenges, enterprises should:

- Select the right tools: As highlighted previously, there are several generative AI tools available for each application, be it text generation, image generation, etc. Enterprises need to select the right tools among the many options, keeping in mind the intended use, cost, integration with the existing systems, data security and privacy, and user experience. These activities will ensure that the digital transformation initiative ROI remains high.
- **Build a comprehensive data strategy:** Data availability is a crucial factor in helping generative AI produce relevant and useful information. Therefore, enterprises need to build a comprehensive plan to acquire and manage/organize organization's business data and make it accessible.
- Use the right training data: When fine-tuning the generative AI tools for specific use cases, enterprises need to ensure that they use a representative dataset that is free of biases, as they can negatively impact model performance. There also needs to be enough data to maximize generative AI performance.
- Embed APIs: To best customize for context, enterprises should leverage the APIs provided by the generative AI tools, which helps generate an output that is contextualized to the enterprise's local database.
- **Construct safeguards:** Despite all the moderation policies generative AI developer companies have put in place, the tools are susceptible to producing offensive, unsafe, or inaccurate content. Enterprises need to ensure there are safeguards/policies in place, including a human in the loop, particularly if the tools are deployed in customer-facing systems; a human check is critical given the potential dire consequences of offensive content.
- Leverage prompt engineering: In generative AI, the output is only as good as the prompt, so users need to make sure that the prompts are detailed and as specific as possible to get the desired output. Users should experiment with different prompts to get the best output.
- Incorporate effective change management: Because generative AI is likely to automate many jobs and change existing employees' job roles, enterprises need to ensure effective change management policies are in place to ensure that employees embrace innovation and enhance their productivity by complementing generative AI with existing tools and techniques.

Future outlook and conclusion

Generative AI is a relatively new form of AI that leverages various ML algorithms to generate new content in different forms such as text, audio, image, video, 3D asset, and image caption. Based on its varied applications, generative AI is finding a lot of use cases across industry-specific and horizontal processes.

Generative AI will have implications for both enterprises and providers. For enterprises, it is about better managing their automation and AI roadmaps and talent strategies. While generative AI offers a lot of opportunities around automation for service providers and technology providers, there are also challenges, such as regulations, heightened competition, and the possibility of the elimination of less competent players from the market. If providers can effectively integrate generative AI with automation solutions such as IDP, RPA, and conversational AI, and provide compelling end-to-end offerings, they can help enterprises yield significantly better outcomes.

Recent developments around ChatGPT and DALL·E demonstrate the impressive progress of generative AI and its vast range of applications. Despite current challenges such as the tendency for bias and ethical concerns, enterprises can adopt best practices such as the use of the right training data, having a human in the loop, and implementing a change management program to derive benefits such as increased employee productivity and enhanced customer experience. The future of generative AI looks promising, with the possibility of creating even more sophisticated and innovative tools that can transform many industries and improve business processes in significant ways.



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