

The Future of Generative AI

Prof. Mohamed M. El Hadi

Sadat Academy of Management Sciences

Abstract

What could we see five years following the launch of ChatGPT. This first iteration of this foresight brief explores some potential shifts and disruptions that arise in the next five years.

As ChatGPT has taken the world's attention, this foresight highlights the 8th key things to know about generative AI, and in the three key areas: critical infrastructure, labor and market conditions, and content production and processing.

Generative AI could unleash scientific innovation, raise productivity, and change way people find information. These technologies for multiple policy horizons aim to strengthen in Government in Egypt.

1. Introduction

Generative AI is a paradigm-shifting technology that could unleash scientific innovation, raise productivity, and change the way people find information online. It is raising a number of concerns for critical infrastructure, as well as for content production and processing.

While generative AI developments date to the 1950s, various refinements have led to emergence of generative AI seen today. 1,2 In late 2022, U.S. based OpenAI released free-t-the-public version

of ChatGPT (a tool for AI-generated text) and DALL-E (a tool for AI generated images and art). In 2023, OpenAI released GPT-4, the first in a series of numbers AIs, meaning they can use a variety of different media formats as both inputs and/or outputs.³

ChatGPT is one commercial product that uses generative AI (as shown in table No. 1 for examples of generative AI capabilities and products). The generative AI products are built on pre-trained foundation models. Which are trained on broad sets of "unlabelled data that can be used for different tasks, with minimal fine tuning." ⁴ This allows these technologies to identify patterns and structures in existing data to generate new, original content.

Table No. 1 Examples of generative AI capabilities and products

Mode	Use Cases	AI models Power Commercial Products	Commercial Products
Text	Content generation Summarization Question answering	GPT-4 LaMBDA LLaMA	ChatGPT Microsoft Bing Google Bard

Image	Text-to-image generation Image manipulation Resolution upscaling	DALL-E 2 Stable Diffusion Midjourney	Bing Image generator Adobe FireEly Nvidia Picasso
Video	Text-to-image generation Video manipulation Resolution upscaling	First Order Motion model Modelscape Adobe Sensei	Synthesia Make-A-Video Adobe Premier
3 Models	3D model generation 3D model editing 3d model animation	Point-E Get 3D BioNeMo	Move -ai Masterpiece Studio SLoyd
Music	Music generation Musical style change	MusicNet MusicLM	Soundraw Jukabox AI
Speech	Text-to-speech synthesis Speech recognition Voice manipulation	AudioLM VALL-E	Murt AI Play.ht
Coding	Code generation Code completion Natural Language Processing	GPT-4 Codex AI	ChatGPT Github

Some AI models are multimodal, meaning they can use a variety of different media formats as both inputs and/or outputs. For example, GPT-4 can

2. Eight things to know about generative AI

There is currently a lot of interest in generative AI, as well as a lot of media coverage. Here are some key points to keep in mind:

2.1 Generative AI is error-prone in ways

that are challenging to detect

While Large Language Models (LLMs) like ChatGPT may appear to be as intelligent as humans, they are more akin to well developed autocomplete systems. They are for error-prone, also they can generate text and looks credible but is incorrect or nonsensical. Some prominent AI researchers questions whether there is a technical solution to this issue, or if a shift to new kinds of AI is required to overcome it.¹³

2.2 The data used to train generative AI models might infringe on privacy and intellectual property right

Many generative models are trained on large parts of the Internet. This raises implications for IP, privacy, fair use, and fair dealing. The privacy commissioner of any data protection authority are investigating ChatGPT to determine whether privacy violation my have arisen.¹⁴ Image generator stable diffusion is facing copyright lawsuit from artists and one more from Getty images. OpenAI and Microsoft face copyright lawsuit related to GitHub Copilot.¹⁵ Claims to copyright infringement based on AI generated voce content of musicians may prove difficult to defend, as AI generated content is not true copy exists.¹⁸ Rulings on such cases could undermine the foundations of which these technologies function.

2.3 The data use to train generative AI models might also perpetuate bias.

Using data taken from Internet to create new AI generated content disproportionately amplifies

the perspectives of those overrepresented on the Internet: typically English speakers.¹⁷ Consequently, certain cultural perspectives are emphasized, while the perspectives of non-English speakers as well as women, older people, indigenous people, persons with disabilities and other groups tend to be excluded.^{18, 19, 20} Because many AI models are closed source, and therefore not transparent to auditors or users, these bases can be challenging to identify and address.

2.4 Generative AI could nonetheless a new era innovation and productivity gains.

Generative AI is multi-purpose technology that could speed up scientific developments, it might disrupt certain domains of work. It may also, enhance productivity across sectors, improve accessibilities, and reshape education.

2.5 It may be difficult to harness innovation gains locally due to dominance of country-based companies of domestic computing power, and concerns over foreign hosted data.

Training generative AI models requires massive amounts of data and computing power, making country-based players such as OpenAI, Microsoft, and Amazon dominant in this space.²¹ A lack of computing power domestically could limit the ability of the country to store or use personal data abroad carries legal and privacy risks. This may create barriers to the research and development of applications that rely on foreign-based data centers. Governments are to collaborate on AI

infrastructure development that are emerging to counterbalance the dominance of private players.
22

2.6 It is unclear where value from use of generative AI will be captured.

The generative AI tech stack includes apps, the generative AI models that power the apps, and the infrastructure that allows the models and apps to operate. In some scenarios, making money from proprietary, closed-source models like GPT-3 might be challenging. Open-access generative AI models^{23, 24} allow anyone to develop their own apps for free. If enough people adopt these open-access models, and if these models perform well enough, closed-source models would be less attractive. There are various layers and actors involved. The trends toward open-access, and the as-yet unresolved IP disputes described above, make it challenging to predict where and for whom generative AI will create the most value, and where this value will be captured. Infrastructures, providers are likely among the most well-positioned to capture value in the ecosystems.²⁵ The amount of value generated for and within country, remains unclear.

2.7 The pace of advancement combined with gaps in regulation could lead to complex and unforeseen risks.

AI has impacts across society, the environment, the economy, politics, and values. Current regulatory approaches focus on finished products rather than embedding standards or norms into the technology development pipeline. For example, identifying

the kind of data used to train an AI model is not presently required.²⁶ As this gap interests with the rapid development in generative AI systems and applications, it could lead to complex and unforeseen risks. In addition, the rapid pace of development could make it challenging to future proof AI regulations.

2.8 Generative AI could raise new concerns about the environmental costs of computation.

Generative AI is a particularly energy-intensive technology, both to develop and use .^{27,28} The information and technologies (ICT) that support the development and use of generative AI are also energy intensive One estimate puts the total footprint of ICT at 2.5 to 3.7 percent of all global greenhouse gas emissions. ²⁹ This exceeds emissions from commercial flights (about 2.4%).³⁰ The information technology (IT) industry could end up doubling its carbon footprint in the coming decade just as other industries are moving in opposite direction.³¹

3. Three Key areas of Impact over the next five years.

Generative AI is said to be transformative technology that could boost stagnating levels of productivity and unleash a new wave of scientific innovation. One recent estimate suggests that generative AI could drive a 7 percent increase in global gross domestic product over ten-year period.³² It could add about 7 trillion dollars per year, and raise net labor in Western countries over

the next 10 years. ³³ The use of generative AI to solve problems in protein folding science could lead to new treatments for cancer, influenzas, and COVID-19.³⁴ Synthetic data could also speed up the training of AI models especially for those relying on sensitive data like patient records.

While these potential gains are impressive, transformative technologies such as generative AI are likely to create disruptions and challenges. There are some concerns to reflect for future.

3.1 Critical Country infrastructure:

Generative AI could put pressure on existing vulnerabilities in critical IT infrastructure. The use of generative AI applications by business, government, and the public relies on domestic infrastructure like overland fibre-optic cables and data centres. Data centres are projected to grow tenfold from the existing ones.³⁵ A large portion of this growth will likely be due to generative AI. Data centre distribution in country is already highly concentrated: the majority of data centers are to spread over all governorates of the country, instead of their concentration in the main Capital of this country, which become problematic in a future where data centers attacks by state actors, extremist groups, or lone actors become more common.³⁶

In short term, but the need to access strategic resources may compete with transition of green energy. This is because data center uses many of the same strategic minerals. Therefore, it needed to get reduce data center ³⁸ cooling costs and allow

to reduce carbon footprint. However, access to strategic metals, water, land, and regional supply may become an increasingly contentious policy issue, as data center demand increased over next decade.³⁸ More data centers, for example, cloud lead to more emissions and e-waste, ³⁹ and more calls for environmental regulation. Economic pressure to expand data centers may be also compete with transition of green energy. This is because data center hardware uses may of the same and strategic minerals found in solar panels, electric batteries, and other green tech.

3.2 Labor and market conditions:

Generative AI could partially or wholly automate creative and language work, It is more likely to augment technical and knowledge work. Trades are least likely to be affected. Generative AI could dramatically reshape and perhaps automate a narrow subset of job roles that rely on creative and language work. These jobs include graphic design, copywriting, and some extent, technical writing, editing, and music composition. In the first years, augmentation is more likely for roles where generative A add to quality and quantity of work done by humans: IT specialist, software developer, finance and accounting professional, architect, receptionist, customer service representative, and engineer. Generative AI will also plausibly augment the roles of business executive, scientist, and policy analyst in areas such as ideation, hypothesis development. Summarization, and decision making impacts on are likely to be quite

small in the trades.

Generative AI may particularly or fully automate many technical coding tasks. This could reduce wages and lead to layoff in what were once considered highly skilled tech jobs. Generative AI systems can now solve complex coding problems in a variety of technical languages with minimal human prompting. The ability of GPT-4 to write targeted programs code libraries, for example, "favorably compares o average software engineer ability, ⁴⁰ AI generated code may also be easier for humans to read and follow. For example, it can automatically generate plain-language documentation that describes the function of each section of code in a way that can be standardized. These capabilities could lead to lower wages in highly paid tech jobs, or even reduced employment. It could be challenging for fields with concerns about liability due to privacy violation or errors of judgment to adopt generative AI support tools. Areas such as medicine, law, banking, and finance, may require humans to verify AI generated information in order to adhere to professional codes of conduct. Making such tools were reliable with results that are easier to interpret could promote greater adoption in these fields.⁴¹

The use of specialized generative AI technologies could lead to market concentration or megafirms in fields where none existed previously. The development of tailor-made models of generative AI trained on proprietary data could promote uptake in specialized fields. Generative AI could

spark profound changes in industries like law. If technology can handle a large portion of work reliably. However, the costs of adopting these technologies about limit their uptake to large organizations, which might lead to the development of megafirms.

3.3 Content Production and processing:

The democratization of high-quality content production and undermine social cohesion. The uptake of generative AI marks a watershed moment on par with the rise of social media and the transition of Web 2.0 permitted users to generate content and participate more actively in virtual and real life communities, 42, 43 it also brought concerns over the bubbles, misinformation, extremism, and election interference. With generative AI individuals will soon be able to create low-cost, profession quality entertainment content. This could give rise to a flood of new amateur content unbounded by the norm set by established media production outlets. For example, this could lead to viral high quality feature length firm expressing misinformation, grievances, and hatred against political leaders, immigrants, or women.

Generative AI could enhance accessibilities for people with disabilities by mediating perception in new ways. Multimodal generative AI products such s enterprises startups that are now relies on GP-4, instead of human volunteers to describe images in real-time for the app, and have an AI powered virtual volunteer answer any question about that image and provide assistance for a

wide variety of tsks. It can describe the food in a fridge, for example, and offer recipes for the cook with it.44 Live video inputs could offer real-time descriptions of the environment and other people, changing the way people with visual impairments perceive and engage with world. In the same way, language transcription technologies could experience of those with hearing impairments. But these technologies 54 raise concerns around both consent and responsibilities for errors.45

Conclusion:

Generative AI is a paradigm shifting technology. Over 202s, it is to grow exponentially, with impacts in many industries. Since generative AI may offer dramatically higher productivity than human labor, there may be a scramble to use it everywhere possible. The ultimate performance of generative AI is unknown. However, the quality of output from larger models supported by new algorithms may continue to surprise. Over the next 1015- years, powerful AI technologies will cause profound shifts in many areas of society. This is likely to bring bigger disruptions extending well beyond initial or obvious areas of impact like labor and productivity. New technologies are often overestimated in short term, and underestimated in long term. Foresight in this domain could help set the groundwork to prepare for even more disruptive futures. While no one can predict the future of generative AI, strategic foresight can help policy and decision makers better prepare.

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