" WILL TAMING GENERATIVE AI THROUGH REGULATIONS SUFFOCATE PRODUCTIVITY AND INNOVATION?"

Research Paper

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"Abstract"

ChatGPT is a form of generative AI, considered to be part of Artificial General Intelligence (AGI). Generative AI is widely recognized to have huge potential for productivity gain and accelerating innovation across industries, sectors and business processes. AI regulations in different countries are primarily targeted for Artificial Narrow Intelligence (ANI) solutions. A rush to regulate generative AI can hamper the potential productivity and innovation gain whereas, lack of proper regulations can adversely affect individuals, companies, and society.

Keywords: Generative AI, AI regulations, ChatGPT, Foundational model, LLM

1 Introduction

ChatGPT, a form of generative AI, has taken the world by storm. It crossed 100 million users in 64 days after its launch on 30th November, 2022 and has continued to grow exponentially. "One goal of AI is to produce Artificial General Intelligence (AGI), or programs that are capable of a wide variety of intelligent tasks, rivalling or exceeding human capabilities. This goal contrasts with the current AI systems that have superior capabilities, much beyond that of the best humans, but in narrow domains, where these are referred to as Artificial Narrow Intelligence (ANI)" (Dwivedi et al., 2023).

Generative AI, part of AGI, is based on a new class of models, Foundation Model. A foundation model is any model that is trained on broad set of data that can be easily adapted (e.g., fine-tuned) to a variety of downstream tasks.

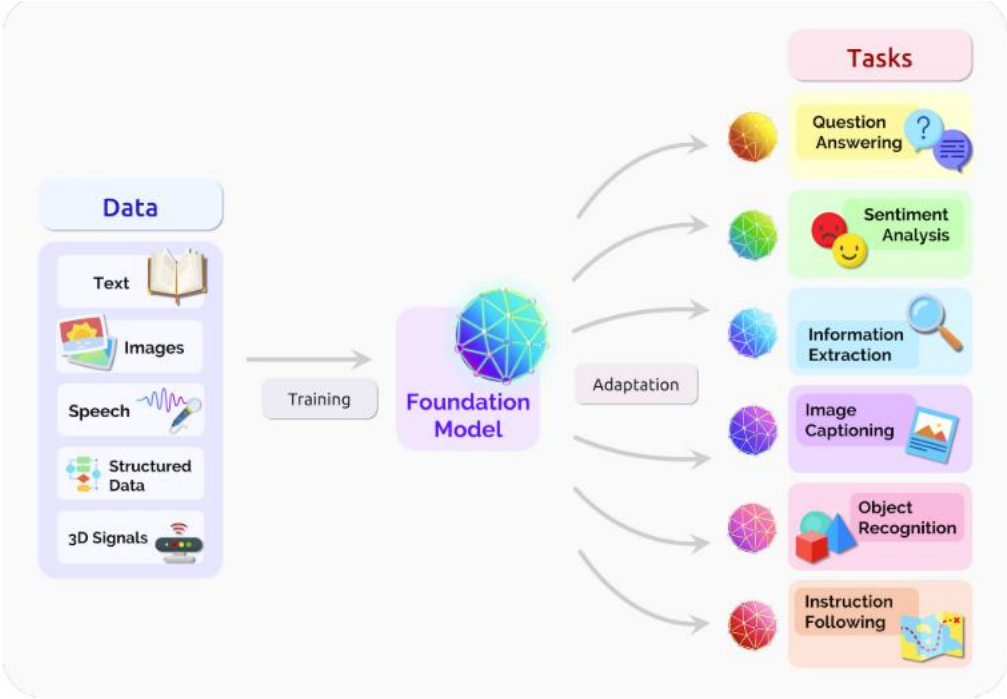


Figure 1 – Foundational model and task level adaptation (Bommasani et al., 2021)

Foundational models have emerged from large scale processing, example GPT-3 with 175 billion parameters compared to GPT-2's 1.5 billion parameters. It facilitates in-context learning, in which the model can be adapted to a new downstream task by a prompt, though it may not have been specifically trained for the downstream task.

Beside raw generation abilities, the most impactful features of foundational models are their generality and adaptability: a foundation model can be adapted to achieve many linguistic tasks. Foundation models are enabled by transfer learning and scale where "knowledge" learned from one task (e.g., object recognition in images) can be applied to another task (e.g., activity recognition in videos). As part of pre-training a foundation model, it is trained on a surrogate task and then adapted to the downstream task via fine-tuning.

1.1 Problem statement

Foundational models have led to homogenization, where any improvement in the foundation model is cascaded downstream easily, it is also a liability. Any biases or risks in the foundational model is cascaded in the subsequent task level training of models.

There is concern that current AI regulations are not sufficient to protect the interests of individuals and companies when it comes to distributed value chain of generative AI. The federal governments in different countries are scrambling to understand the risks and biases associated with generative AI and how to regulate them. This paper takes a qualitative approach to understand the benefits of generative AI and the potential implications of regulations on them.

1.2 Purpose of the study

This research intends to understand how some of the big economies (US, UK, China) are approaching regulations related to generative AI. Another focus area is to explore the impact of tighter regulations on generative AI. Currently, generative AI regulations are under the ambit of broader AI regulations. However, there is growing demand for regulations specific to generative AI.

1.3 Significance of the study

This paper will help companies understand the current landscape of regulations and approach by regulators in some of the major economies. This paper will add to knowledgebase for the future reseachers who wants to get a perspective on impact of regulations on the growth of generative AI.

2 Theoretical Background

When discussing the regulations for generative AI, there are multiple approaches as pursued by different countries. Except China, other major countries are pursuing generative AI regulations using their broader AI regulations framework. However, there is concern that the existing AI regulations are not sufficient to cover the risks of generative AI.

2.1 Commoditazation of Artificial Intelligence

The phenomenal growth of ChatGPT and the release of LLMs by some other technology vendors (Google, Meta, Salesforce, Bloomberg, Alibaba, etc.) have lent access to generative AI to a wider audience. Covid-19 gave impetus to companies world-wide to digitalize the business processes that make more data available in digital form. Several factors like cloud computing, competition between technology vendors, growing demand for AI solutions, open-source software is driving the commoditization of artificial intelligence.

2.2 Widening gap between fast-paced technology and regulations

There is a general perception that AI regulations related to generative AI is lacking proper guardrails and regulations. The US federal legislators called upon OpenAI, Alphabet, and Microsoft CEOs to get their perspective on regulations for generative AI (Fung, 2023). Generative AI use cases goes across industries/sectors and both the voluntary risk management framework and existing sectoral regulations may not be sufficient to address the risks.

3 Literature Review

3.1 Generative AI regulations

The researcher has conducted secondary source review of existing regulations, non-peer reviewed research papers, news articles, consulting companies' whitepapers to understand the current state of AI risks, regulations and gaps related to generative AI.

3.2 UK risk-based approach

The Department for Science, Innovation and Technology (DSIT) in their white paper has outlined five principles for companies to follow. These principles are: 1) Safety, security, and robustness; 2) Appropriate transparency and explainability; 3) Fairness; 4) Accountability and governance; 5) Contestability and redress (UK Govt AI Reg White Paper, n.d.).

The risk management framework underpinning these principles is context-specific risk level assignment. Rather than assigning risk levels to entire sector or technologies, it regulates based on the outcomes AI is likely to generate in specific applications. AI risk assessment includes the cost of failure to exploit AI capabilities (opportunity cost) as well.

The current sectoral regulators are expected to conduct detailed risk analysis and enforcement activities within their domain. The white paper highlights that creating a new AI-specific, cross-sector regulator would unnecessarily introduce complexity and confusion, undermining and likely conflicting

with the work of existing expert regulators. Regulators are expected to apply the principles proportionately to address the risks posed by AI, in accordance with existing laws and regulations.

The white paper makes minimal reference to generative AI or Foundational Models and how to regulate them. It mentions the risks of hampering innovation by allocating too much responsibility to businesses developing foundation models, on the grounds that these models could be used by third parties in a range of contexts.

There is a small number of organizations developing foundation models. Some organizations maintain close control over the development and distribution of their foundation models. Other organizations have taken open-source approach to the development and distribution of the technology. Open-source models can improve access to the foundation models, but can cause harm without adequate controls. The potential opacity of foundation models can pose challenges in identifying and allocating accountability for outcomes generated by AI systems that rely on or integrate with them.

The proposed central functions to regulate foundational models, will play an important role in validating risk-based approach. The central risk function's monitoring of risks associated with foundation models will be key input to developing legislative regulations in future.

The UK Government has tried to avoid rushing in legislation for evolving generative AI. It has taken an approach to avoid allocating too much responsibility to businesses developing foundation models, on the grounds that these models could be used by third parties in a range of contexts. Similarly, inappropriate allocation of liability to a business using, but not developing foundational models, could stifle AI adoption.

"One of the key recommendations is to make the UK Government announce a clear policy position on the relationship between intellectual property law and generative AI. It should enable mining of available data, text, and images (the input) and utilize existing protections of copyright and IP law on the output of AI. The bottom line is to facilitate the availability of public and IP protected data in a responsible way for the Generative AI" (Pro-Innovation Regulation of Technologies Review Digital Technologies, 2023).

3.3 US AI regulations

In the US, there are multiple AI risk management frameworks and US Government Acts, NIST Risk Management Framework (Tabassi, 2023), Algorithmic Accountability Act of 2022 (17th Congress 2D Session, 2022), AI Bill of Rights (AI Bill of Rights making automated systems work for the American people, 2022), OECD Classification of AI Systems (OECD Digital Economy papers OECD framework for the classification of AI systems, 2022) to provide a framework and guardrails for developing and operationalizing AI systems.

"The NIST's AI Framework is intended to be voluntary, rights-preserving, non-sector-specific, and use-case agnostic, providing flexibility to organizations of all sizes and in all sectors and throughout society to implement the approaches in the Framework" (Tabassi, 2023).

NIST's AI Risk Management Framework hardly makes any mention of risks associated with generative AI. It does recognize that risks from third-party software, system and data may pose different challenges: misalignment of risks metrics and methodologies between the organizations developing AI systems and organizations deploying and operating such systems and also lack of transparency between them.

(Kolt, n.d.) is of the opinion that "The principles enshrined in the White House's AI Bill of Rights and the practices outlined in NIST's AI Risk Management Framework make scant reference to misuse and proliferation. Whether federal regulations or agency actions will fill this gap in the future is an open question." The researcher agrees with (Kolt, n.d.) that the problem with general-purpose systems is

that any safety risks they pose—including robustness errors, harmful biases, and misalignment with societal values—are likely to propagate downstream.

The researcher agrees with (Sarel, n.d.) "The United States currently does not have comprehensive legislation to address risk and liability questions related to generative AI at the national level so has focused instead on a more comprehensive attempt to restrain AI, by turning to proposals in the European Union."

Besides, there are multiple US states with their own AI regulations. However, the scope of individual acts in different states are narrow in scope and addresses limited risks in AI. Example, Alabama Act No. 2022-420– Artificial intelligence, limits the use of facial recognition, to ensure artificial intelligence is not the only basis for arrest. There is no act at the state level that addresses the risk of generative AI.

3.4 China AI regulations

China has taken a bespoke approach to regulating generative AI. The regulation is targeting generative AI alike deep synthesis algorithms that use training data to generate new content. The regulation requires that prior to using images or voices for creating new content providers must get consent from individuals. This application-specific requirement is part of the vertical nature of the regulations followed by China.

China's regulations do have a horizontal element as well. They have created certain horizontal regulatory tools that spans across several different vertical regulations. An example is their algorithm registry (**算法**备案系统, literally "algorithm filing system"). The algorithm registry was initially created by their recommendation algorithm regulation and later reaffirmed by the deep synthesis regulation. Both requires AI developers to register their algorithms. It is used as a central database for gathering information on algorithms, which includes sources for training data and potential security risks in the AI system. The registry also serves as a mean for regulators to learn about how AI system is being built and deployed (Lessons From the World's Two Experiments in AI Governance - Carnegie Endowment for International Peace, n.d.).

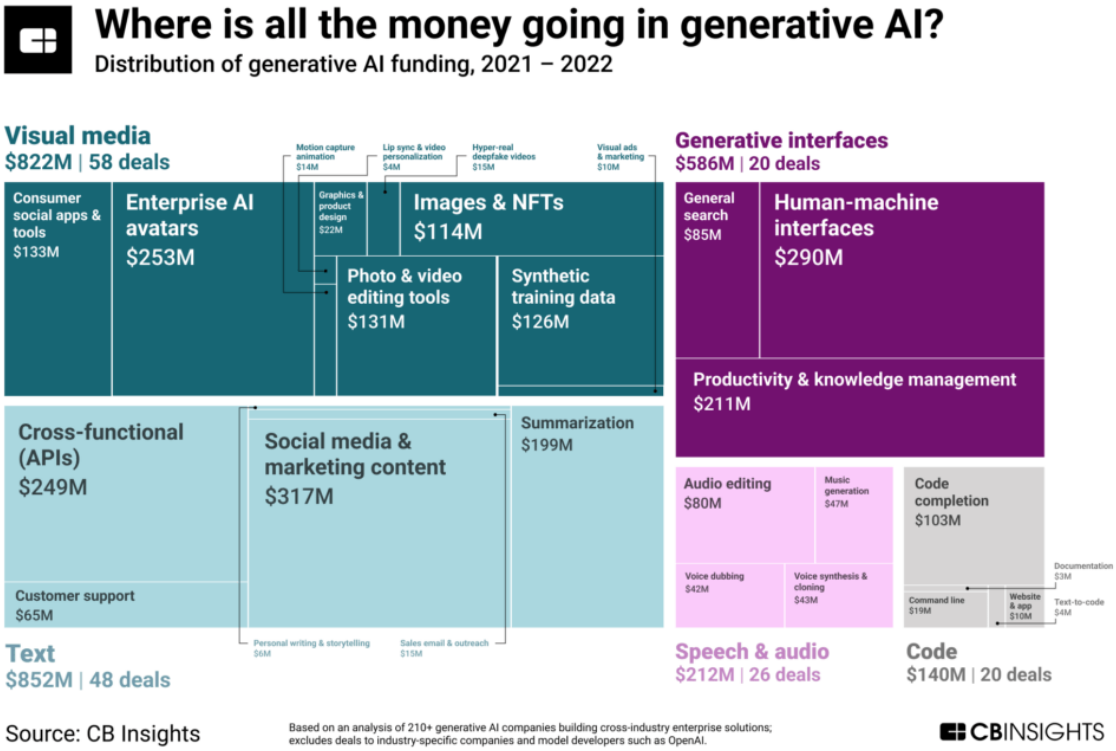
China's approach allows it to target specific technical capabilities of AI systems. One of the challenges of this approach is the risk where rules can fall behind quickly evolving technology. In China's AI regulation, some requirements are not well defined. It is evident that government regulators wield more power in enforcing rules that may be detrimental to growth of AI systems.

3.5 Productivity gain using generative AI

Generative AI is noted as bringing about inflection point for Artificial Intelligence (How Generative AI Changes Productivity, 2023). Machines are not likely to replace humans but humans with machines will replace humans without machines. The productivity gain is supposed to be asymmetric across different professions and industries as the highly-skilled or knowledge workers are more likely to get impacted as against the low-skilled workers. According to Goldman Sachs report, ChatGPT could impact 300 million jobs worldwide. Per the investment firm, up to 7% of jobs could be entirely replaced by AI with 63% being complemented by AI-powered tools. The remaining 30% would be unaffected (ODSC Team, n.d.).

Clearly, generative AI is perceived more as productivity enhancer technology rather than job replacer.

As the interest and use cases for generative AI is growing, there is unprecedented interest in the startups ecosystem to leverage the newer technology.



Generative AI's impact on productivity could add trillions of dollars in value to the global economy. About 75 percent of the value that generative AI use cases could deliver falls across four areas: Customer operations, marketing and sales, software engineering and R&D.

Business Functions	**Likely productivity growth due to generative AI**
Customer operations	30 to 45 percent of current function costs
Marketing and Sales	5 to 15 percent of total marketing spend 3 to 5 percent of current global sales expenditure
Software engineering	20 to 45 percent of current annual spending
R&D	10 to 15 percent of overall R&D costs

Table 1. Generative AI's productivity impact across business functions (Chui et al., 2023)

"Current generative AI and other technologies have the potential to automate work activities that absorb 60 to 70 percent of employees 'time today. Generative AI has more impact on knowledge work associated with occupations that have higher wages and educational requirements than on other types of work. Generative AI could enable labor productivity growth of 0.1 to 0.6 percent annually through 2040, depending on the rate of technology adoption and redeployment of worker time into other activities" (Chui et al., 2023).

3.6 Innovation edge using generative AI

Creativity has always been human trait. With the advent of generative AI, creativity has taken on a new dimension. Not only ideas can take shape faster but the use of generative AI has opened new ideas and business models. Whether designing augmented reality filter for a client, a commissioned art piece, a 3D model, a 3D sculpture, a video edit, an animation, all these things used to take a lot of time. Now with the text-to-image editor generative AI tools, the iterations of ideas and show to a client has shrink the time to almost zero.

Some of the generative AI tools have started filling the gap between different level of experiences in creative field. A video shot by a regular phone camera can be converted into animation movie with real background, courtesy Wonder Dynamics. It used to take a team to develop such short animation movie but the generative AI has enabled an individual with almost no animation movie experience, an expert content generator.

How companies innovate, leverage design thinking approach with quick experimentation, brainstorm of new ideas and prototype, are all getting affected by generative AI.

A study was done by Hargadon and Sutton on the design consulting firm IDEO. It was noted in the study that the competitive advantage for those designers was to be able to take knowledge from one domain in one technology or industry and apply it into another one where it was not known.

Generative AI is giving us those kinds of recombination from different industries and domains in ways that we might not have considered before.

Generative AI is good at creating new design (images, art piece, videos, etc.) but it lacks sensitivity and sense of usefulness. A human input is needed to validate and augment the output created by generative AI. In many cases it uses the copyright content and morphs into new content. The key question remains who owns the new content and the liability issue with copyright infringement. Another open question is about the copyright of content created by generative AI.

4 Observation and Discussion

The research is an exploratory study and employs a qualitative approach. It involved a documentary search of online sources to understand the current state of AI regulations and the gaps related to generative AI.

This section contains the SWOT (**S**trength, **W**eakness, **O**pportunity, and **T**hreat) analysis for the lack of generative AI regulations and its implications.

4.1 Strength

Lack of generative AI regulations have contributed to phenomenal growth and wider acceptance of using it as toolkit for various purposes. An AI solution is built for a specific purpose whether it is meant for recommendation, decision support, monitoring or any other specific outcome. “Generative AI is artificial general intelligence (AGI) and has ever evolving use cases across industries, sectors, and business processes. In contrast to the current distributed and varied model of decision making, employing many adaptations of the same foundation model for multiple automated decision-making tasks means that decision subjects may face a more homogeneous set of judgments rooted in the underlying foundation model” (Bommasani et al., 2021). Generative AI has created a distributed AI value chain where foundational model developers (Open AI, Google, Meta, and others) are unaware of the context and use cases of task-oriented deployment of their models. A lack of strict regulations for foundational model developers has enabled the growth of such models and adaptation throughout the distributed AI value chain. These foundational models are trained on large public data and may contain copyright and unauthorized data as the model developers have not disclosed all the content sources and the method to curate the data. Due to lack of transparency by foundational model

developers, it is hard to say if all the underlying data used for training is curated for bias, copyright, and personal unauthorized data.

The researcher believes that a strict generative AI regulation would have stifled innovation and discouraged startups from trying new use cases due to upfront regulatory burdens.

4.2 Weakness

The researcher agrees with (Bommasani et al., 2021) that the current un-interpretability of foundation models and their task-agnostic training makes predicting, understanding, and addressing these weaknesses challenging. “If, as seems likely, foundation models become widely adopted, foundation model developers bear greater responsibilities of care than standard model developers, as their choices in design and deployment have widespread implications” (Bommasani et al., 2021).

Certain industries need immediate regulations to stop value erosion due to uncontrolled use of generative AI. The Music industry is directly affected by copyright issues as the generative AI can create new music manipulating voice and style of music artists. Deep fake is serious concern as generative AI can create new text, voice, images, and videos by manipulating existing content. It is difficult for an average person to distinguish the difference between original and fake content. “Balenciaga Pope” was in the news recently where a fake image of Pope had gone viral (Perrigo, n.d.). Deep fake can have serious societal and individual implications. Women are particularly targeted in nonconsensual deepfake pornography. Politicians, celebrities remain vulnerable to generative AI technologies creating fake images and videos. Trust is at the core of any society. Deepfake impacts trust as the whole political and social discourse is at stake.

Lack of existing regulations related to generative AI is concerning for big companies as copyright and data privacy issues in foundational models may come back to them as legal suit. Business leaders have concern as they plan to use generative AI without full understanding of data privacy and copyright issues and lack of regulations that defines responsibility for omission on part of model developers. Generative AI makes enterprise AI governance more difficult because it extends the use of AI outside knowledgeable data science teams. The so-called “no code” or “low code” technologies enable AI to be used, in a similar way to Excel and Access, by “business technologists” who may not understand the full implications of its use. The problem of managing AI risks in organizations has gone up. It has expanded from a small team of knowledgeable professionals who knows what they are doing, to a large number of people who may not fully understands the risks.

Lack of regulations may encourage insurance companies to make use of generative AI chatbot as replacement for doctors in first place except serious medical situations.

4.3 Opportunity

Generative AI has created a new startup eco system where solutions developed are broader and can be applied across different industries and sectors. A chatbot to support client interactions can be easily trained on any knowledge database and can be adapted to different industries. It is hard to quantify the impact of lack of generative AI regulations on this growth of startup eco system but the impact is obvious. A sectoral approach to regulate generative AI is not sufficient as the nature of technology permeates across industries and sectors. There is an opportunity for better self-regulation and coordination of industry leading best practices across sectors. The US Government has recently announced that it has secured voluntary commitment from seven leading AI companies: Amazon, Anthropic, Google, Inflection, Meta, Microsoft, and OpenAI to move towards safe, secure, and transparent development of AI technologies. The seven leading AI companies have committed to both internal and external testing of their systems before releasing to public. They have also committed to sharing information with governments, civil society, industry, and academia on managing AI risks. This includes sharing best practices for safety and information on attempts to circumvent safeguards. To build the public trust, they have committed to developing transparency to ensure that

users know when content is AI generated, such as a watermarking system. This will enable creativity with AI to flourish but reduces the risks of fraud and deception. The companies have committed to publicly report their AI systems 'capabilities, limitations, and areas of appropriate and inappropriate use. This report will cover both security and societal risks, such as the effects on fairness and bias (The White House, n.d.).

The UK Government has recognized the need for central coordination, monitoring and adaptation of their risk framework. These mechanisms will supplement and support the work of sectoral regulators. Such mechanisms are not intended to duplicate existing monitoring activities. This will provide government with an overarching view of how the framework is working, where it is effective and where it may need improving (UK Govt AI Reg White Paper, n.d.).

4.4 Threat

Lack of regulations specific to generative AI has its own pitfalls. There is concern that the foundational models are trained on data that have biases and may contain unauthorized and copyrighted data. The U.S. Federal Trade Commission has launched an investigation into ChatGPT creator OpenAI and whether the artificial intelligence company violated consumer protection laws by scraping public data and publishing false information through its chatbot. As reported comedian Sarah Silverman and two other authors have filed lawsuit for copyright infringement (Hamilton, n.d.).

Thousands of writers including Nora Roberts, Margaret Atwood, Viet Thanh Nguyen and Michael Chabon have signed a letter asking companies like OpenAI and Meta to stop using their work without permission or compensation (Veltman, n.d.).

Last November, OpenAI and Microsoft were sued in a class action lawsuit filed by GitHub programmers who alleged that GitHub Copilot, an AI coding tool owned by Microsoft, violated their open-source licenses, and used their code for training without their permission (Xiang, n.d.). "A new class action lawsuit was filed in June 2023 in San Francisco against OpenAI and Microsoft for allegedly stealing vast amounts of private information from internet users without consent in order to train ChatGPT. The lawsuit compares OpenAI to another AI firm that made headlines for scraping people's information from the internet without their explicit consent: Clearview AI, which gathered social media photos in order to build a facial recognition tool widely used by police. Clearview AI was sued by multiple parties including the ACLU. The firm last year, and stopped offering its services to most private U.S. persons and businesses" (Xiang, n.d.).

The rapid rise of artificial intelligence and lack of proper regulations have raised concern that AI can get superintelligent and start controlling its own destiny. The researcher believes that AI bots are not sentient (yet!) and technologically we are still not there in foreseeable future to create such robots. "I think a lot of the warnings of existential threats relate to models that don't currently exist, so-called superintelligent, super powerful A.I. models." As quoted by Nick Clegg, president of global affairs at Meta (Taylor, n.d.).

Open and closed source LLMs pose different risks. Though ChatGPT (closed source LLM by OpenAI) has hogged wider public attention in the past year, there are number of other closed source LLMs (Bloomberg's BloombergGPT, Deepmind's Gopher, Baidu and the Peng Cheng Laboratory developed ERNIE 3.0 Titan, etc.). There are number of foundational LLMs (Nvidia's NeMo, Meta's Llama, Google's PaLM, H2O.ai's h2ogpt, etc.) which are open source and can be easily fine-tuned by individuals or corporate for their purposes. An open source LLMs pose higher risks than closed source LLMs.

4.5 Summary

It is obvious that generative AI (ChatGPT, MedPALM) has gone into a new territory where there is concern about lack of governance, regulations falling short, and AI going amok as it can create new

data (audio, video, and text) with make-believe feel. Below is the summary of SWOT analysis of lack of regulations on generative AI.

SWOT	**Lack of generative AI regulations impact**
Strength	• Quicker adaptation of use cases across different industries and sectors • Impetus to innovation as regulation burden is minimal • Helps in commoditaiztion of AI
Weakness	• Distributed AI value chain where transparency, explainability and accountability not well defined and regulated • Potential misuse with serious implications
Opportunity	• Opportunity for self-regulation and transparency by major technology companies • Coordination of leading practices across different sectors • Coordination with other territories across the world • Incorporate lessons learned from China's vertical approach
Threat	• Data privacy, copyright, security, and bias concern not fully addressed for generative AI • Corporate concern for legal suit as regulations are not defined • AI going amok

Table 2. SWOT and lack of generative AI regulations impact

5 Conclusion

Current AI regulations aren't enough to address the risks and biases emanating from generative AI. However, governments should not rush in to fill in the gaps and inadvertently suffocate the huge potential of this evolving technology. In light of the approach by the UK and China government, it is best to approach regulations as pursued by the UK government. Rather than centralizing generative AI risk management, the sectoral AI regulations approach where the risks and regulations are analyzed and maintained by sectoral regulators seem more appropriate for generative AI. A centralized (cross-sectoral) team to share best practices, industry feedback and industry-regulators consultation can stay on top of risks associated with generative AI. This approach is similar to what the UK government is pursuing for generative AI.

The researcher has relied on secondary knowledge sources as most of the research paper on this topic is not peer reviewed yet.

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