Dean&Francis
ISSN 2959-6130

How the Artificial Intelligence industry is Growing: A comparison of the current development of Chat GPT's Chinese and American "fast followers" Ernie Bot and Google Gemini

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Abstract:

As people increasingly rely on AI nowadays, various AI industry are being developed in China and the US to serve different purposes.This research will explore the rise of these fast followers in the Generative AI industry and compare their market share, business model and competitive advantage of each fast follower.Then Through the PEST model, we analyze how the macro background of different countries has affected the development of these fast followers.

Keywords: Artificial Intelligence, Business model, fast followers

ISSN 2959-6130

1. Introduction

In the rapidly evolving business world, the global Generative Artificial Intelligence market size was valued at $43.87 billion and is projected to significantly impact the global economy in the coming years(Generative AI Market Size, Share | Research Report [2032], n.d.). As a "concept innovator," ChatGPT has become the pioneer of the AI industry. Following its initial success, companies like Google Gemini and China's ERNIE Bot have emerged as "fast followers." These companies utilize a computational model known as the Large Language Model (LLM). Based on LLMs, they can gather information from various sources such as books, articles, websites, and social media to solve problems effectively. According to a survey , 65% of business leaders in the United States reported using generative AI in their operations, whereas over 80% of Chinese business leaders were using generative AI in their operations (Gordon, 2024).

2. Literature review

Artificial intelligence (AI) is a technology that enables computers and machines to simulate human intelligence and problem-solving capabilities.In 2004, John McCarthy wrote a paper "What is Artificial Intelligence?" and proposed a frequently cited definition of artificial intelligence. - It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

Subsequently, the further development of AI has given rise to Generative AI. Generative AI is a deep learning model that can acquire raw data and "learn" to generate statistically possible outputs when prompted. At a higher level, generative models encode a simplified representation of their training data and draw inspiration from it to create new work that is similar but not identical to the original data. Among the first batch of artificial intelligence models to achieve this cross feat were Variational Autoencoders (VAEs) introduced in 2013. VAEs were the first deep learning models to be widely used to generate real images and speech. Akash Srivastava, a generative AI expert at the MIT-IBM Watson AI Lab, said: "VAEs opened the floodgates for deep generative modeling by making the model more scalable. Much of what we think of as generative AI today started here.

In 2023, the rise of large language models (LLMs) such as Chat GPT has brought significant changes to the performance of AI and its potential to drive enterprise value. Through these new generative AI practices, deep learning models can be pre-trained on a large amount of raw, unlabeled data and bring convenience to human production and life. This marks the continuous progress of artificial intelligence technology and the significant improvement of model accuracy, ushering AI into a new era. The demand for the AI software market and service market will continue to grow, driving the expansion of the AI market scale.

3. US's innovator: Chat GPT

Chat GPT is an AI language model and virtual assistant developed by Open AI, it was launched on November 30, 2022. It was designed to provide various information and solutions based on users' questions, as well as engaging in human-like conversations.

Based on the December 2023 update, Chat GPT has over 180.5 million monthly users, and 100 million weekly active users. while its user base keeps expanding as more consumers and businesses start to use it due to its advanced language processing abilities and practical applications in many fields.

This table presents the top generative AI chatbots by market share in the U.S. as of July 2024. From the table, it is notable to see that Chat GPT holds more than half of the market share .

Table 1: Top Generative AI chatbots by market share-july 2024 (Bailyn, 2024)

	Generative AI Chatbot	Description	LLMs Used	AI Search Market Share	Estimated Quarterly User Growth
1	**ChatGPT**	General-purpose AI chatbot	GPT-3.5, GPT-4	61.3%	6% ▲
2	**Microsoft Copilot** (formerly Bing Chat)	General-purpose AI assistant	GPT-4	15.6%	7% ▲
3	**Google Gemini** (formerly Google Bard)	General-purpose AI assistant	Gemini	13.3%	9% ▲
4	**Perplexity**	Accuracy-focused AI search engine	Mistral 7B, Llama 2	3.1%	10% ▲
5	**Claude AI**	Business-focused AI assistant	Claude 3	2.5%	18% ▲
6	**Brave Leo AI**	Privacy-focused AI assistant	Mixtral 8×7B	1.4%	10% ▲
7	**Komo**	Link-surfacing AI search engine	*Not publicly disclosed*	0.7%	6% ▲
8	**Andi**	Simplicity-focused AI search engine	*Not publicly disclosed*	0.7%	4% ▲
9	**You.com**	General-purpose AI search engine	GPT-3, GPT-4	0.5%	3% ▲
10	**Phind**	AI search engine for developers	Phind-34B, Phind-70B, GPT-4	0.4%	20% ▲

Table 2: Business model for ChatGPT

Value created	Value captured	Cost to provide the value
The benefits and utility provided to users and businesses	The revenue and market share obtained by ChatGPT	The expenses involved in maintaining and developing ChatGPT, including operational and R&D costs.
-Advanced language processing abilities -Practical applications in education,healthcare, financial services,etc. -Engaging human-like conversations -Accessibility to a wide range of users.	-61% market share in the generative AI chatbot space. -Over 180.5 million monthly users. -Over 100 million weekly active users. -ChatGPT plus:$20/month -ChatGPT Enterprise: $50/month.	-Cost per query GPT-3.5:$0.002 per 1,000 tokens, GPT-4:$0.03 per 1,000 prompt tokens and $0.06 per 1,000 completion response tokens

4. US's fast follower: Google Gemini

One of the fast followers, Google Gemini is the first and the most capable AI model introduced by Google on December 6, 2023. Google Gemini was launched in 2024, building upon Natural Language Processing (NLP) and large language model (LLM) to understand and generate human language effectively. Unlike other competitors, Gemini has real-time information updates in both free and paid versions. This feature is a key reason why some people prefer Google Gemini over other AIs, as it ensures they have the latest information available.

ISSN 2959-6130

Table 3: Business model for Google Gemini

Value created	Value captured	Cost to provide value
-basic function (ex. writing assistance, data analysis, language translation, presentation design) -Enhancing user experience across Google owned products -Real-time information updates in both free and paid versions	-Gemini pro for subscription fee Gemini Advanced: $19.99/month as part of Google One AI Premium plan Business plans: Gemini Business: $20/user/month (on top of Google Workspace) -Customer engagement by the integration of Google owned platforms	-Estimated $191 million for Gemini Ultra model alone -Input: $0.000125 per 1,000 characters (approx. $0.00035 per 1 million tokens for prompts up to 128K tokens) -Output: $0.000375 per 1,000 characters (approx. $0.00105 per 1 million tokens for prompts up to 128K tokens)

5.China's fast follower: Ernie Bot (Wenxinyiyan)

Ernie Bot is a large language model that created by Baidu. Baidu is the first major Chinese tech company to unveil a comprehensive Al chatbot service on March 16, 2023 (Gillham, 2024). As a fast follower of ChatGPT, It also owns a significant position in the Chinese market by inventing localized functions that adapt to Chinese language habits and traditional customs.

As the first batch of generative AI app in China, ERNIE Bot's usage ranks is the first .In December 2023, the number of users exceeded $100 million, User usage then grew rapidly, till April 2024, the number of users exceeded $200 million.Now,in june 28th 2024,the number of users exceeded $300 million.

The developers behind Ernie Bot is big company Baidu which has a market cap of $32.35 billion (Baidu (BIDU) - market capitalization 2024). Baidu has invested 140 billion yuan ($19.22 billion) in research and development over the past 10 years(Gillham, 2024). With the help of a large company and a huge amount of investment in china, Ernie Bot quickly develops into a mature and advanced model. Furthermore, Baidu is the biggest search engine in the Chinese market which offers an AI portfolio that includes applications, models, and chips. It also provides a large database and massive data resources, as well as advanced natural language processing technology that Ernie Bot enables to provide users with accurate and timely information and services.

Ernie Bot was released about 4 months after the official release of ChatGPT, at that time ChatGPT was not widely used and disseminated in China because OpenAI is not open to Chinese users. So people in China have easier access to Ernie Bot rather than ChatGPT.

Table 4: Business model for Ernie bot (Wenxinyiyan)

Value created	Value captured	Cost to provide value
-To business: In the first quarter of Baidu's official announcement of Ernie Bot, more than 650 companies have announced access to the Ernie Bot ecosystem. For example, to compete with new cloud computing companies, Wenxin will provide services through Baidu intelligent cloud to help enterprises build their models and applications, and the efficiency of key areas such as agriculture, industry, finance, education and medical care will be greatly improved. -To customers: Ernie Bot can write articles and reports, create poetry for customers, which provides them inspiration, ensures the relevance of the content. Customers can directly ask questions and get responses from Ernie Bot, which saves time in researching. Ernie Bot provides translation service. Companies face multilingual audiences and international communication, so Ernie Bot breakthroughs language barriers. -Data shown: as of June 2024, Ernie Bot has generated 7 billion lines of code, created 590 million articles, compiled millions of professional research reports, answered 170 million learning questions, and assisted 130 million people in work. (China Times, 2024).	-The 4.0 version is charged for 59.9 yuan (around $8) per month -Advertising (Cooperation is currently being sought)	-Till january 29th 2024, overall is $19.22 billion in research -Maintenance fee

6. Compare of this three AI industry

In conclusion, the value created by Google Gemini and Ernie Bot for business and customers is similar to Chat GPT, including building models, answering questions and creating articles. The value captured part is also captured from the subscription fee for an advanced version. While there are also some differences, for example, there is no advertising in ChatGPT and investment cost for ChatGPT is much higher than Ernie Bot.

In technology Google Gemini and Ernie Bot is built based on the LLM—large language model, This is similar to ChatGPT.which means that they both have data processing capabilities. Secondly, they all have a large database that helps them access accurate resources and data that stays up to date with the latest events happening throughout the world.

Ernie Bot and Google Gemini are likely to learn from and get inspiration from Chat GPT's model, but they also introduce their own features. For the new AI market in China, Ernie Bot focuses more on Chinese users, which better understands and corresponds to the complex language expression and context in chinese. But in the US, there are more people accept Chat GPT for its be used early.

Furthermore, Ernie Bot is the first domestic AI app to be fully available to the public in China (Gillham, 2024). First mover means that Ernie Bot has less competitors in the Chinese AI market and a large potential user base in China which can easily achieve economies of scale.That shows us , timing is a crucial factor for Ernie Bot's rise. which make Ernie Bot is more successful than Google Gemini . Meanwhile, Ernie Bot and Google Gemini are not the first AI model in a global world. There are fast followers of ChatGPT. The advantage of being a fast follower is that it can learn from an innovator's mistakes in order to improve its chance of success.

7. PEST comparison between US and China

Table 5: brief conclusive table for PEST model

	US	China
Political	Regulations in the US are generally designed to promote innovation and competition.	Domestic strict censorship regulations and export restriction of semiconductor technology from the US lead to less effective and biased AI systems. However, limitations on foreign chatbox platforms creates opportunities for local AI startups to develop.
Economic	The US ranks first in the global AI market share and amount of financing in the field of AI.	China is second only to the US in the global AI market share and amount of financing in the field of AI.
Social	Strong government support and a thriving business environment promote AI development in the United States.	Chinese open mindset and government support towards AI technology create a supportive environment for innovation and development of AI industry.
Technological	The US AI technology already experienced several periods of boom and recession since twentieth century, and back in 1966, the world's first chatbot, which is similar to LLM model, Eliza is introduced in US.	China's history on AI technology is much shorter and younger than the US.

(1)Political:

The AI industry in China and the US operates in a distinct environment shaped by their political systems and government regulations. From the latest update of the global artificial intelligence market, the US remains the dominant role in the AI startup ecosystem, companies such as Open AI, google, microsoft are at forefront. Nevertheless, China's AI companies are seeking the potential and attempting to catch the lead of Open AI, closing the gap of development out of technological issues. However, the Joe Biden administration's plan is aimed to restrict the export of advanced semiconductor technology from the US, which might potentially curb Chinese AI entrepreneurs from evoking technological issues, limiting their development.

The US government aims to maintain the superiority in the AI industry by tightening the export restriction for China. From China's perspective, the regulation of censorship might restrict the information extracting and collecting process from datasets since the government would not like to have some certain sensitive political information outflow. Beijing imposes strict regulations on

ISSN 2959-6130

data privacy and security,Such as the personal information protection Law(PIPL) and Data security. These laws require stringent data protection measures and enforce severe penalties for any violations. As a result, Censored data limits the scope and diversity of information, leading to less effective and biased AI systems. Especially for LLM(large language model) which requires vast amounts of information collection.

US, on the other hand, regulations are relatively less stringent, focusing more on fostering innovation, its regulatory environment tends to be more flexible and it has varied data privacy. Regulations in the US are generally designed to promote innovation and competition. US's open, market driven environment allow it to hold greater access to global markets and international collaboration opportunities.In May 2021, the Chinese government banned ChatGPT and other chatbot platforms using similar technology due to worries about data privacy, security, and potential misuse of AI. They also expressed concerns about the impact of these chatbots on national security and public order. (China ChatGPT Ban: Implications for the Chatbot Industry and Beyond, 2023) The absence of ChatGPT in China creates a substantial market gap and opportunity for generative AI chatbots and other local AI startups to develop, thus facilitating the development of China's AI startups.

(2)Economic:

In the first half of 2023, total global venture capital financing was $144 billion. According to Crunchbase, investment in AI accounted for 18% of all venture capital investment, amounting to $25 billion.

According to the International Data Corporation 2023 report, the United States and China account for 39% and 21% of the global AI market, respectively, and together account for 60% of the global market. Up to now, the United States is 54.01% ahead of China in the amount of financing in the field of AI, accounting for 50.10% of the global total financing; China is second only to the United States, accounting for 33.18% of the world; The rest accounted for 15.73%.

Therefore, we know that the investment of China and the United States in the field of AI is very large, and the financing capacity of the AI market in the United States is stronger than that of China. There is a large amount of capital investment behind the large language model and generative AI products, whether it is OpenAI or Baidu, Google Gemini, the investment in AI research and development is tens of billions of levels. For example, OpenAI twice received a total investment of $11 billion from Microsoft, and Baidu's AI core research and development expenses reached 21.416 billion yuan ($2.933 billion) in 2022.Google Gemini's research and development investment in 2023 for four consecutive quarters increased by 8% to 26%, and the annual research and development expenses reached $45.4 billion. At present, from the point of view of the amount of investment, the three companies do not have public data showing the total investment, but they are very large.

(3) Social:

China's AI industry development is largely driven by a strong government push due to its view that the technology is critical for the future development of innovation and digital life.

The AI landscape in China encompasses a wide and varied audience, reaching across numerous sectors and demographics. The government is a key force behind AI development in China, incorporating it in public security and various public services. This top-down strategy makes sure that AI is adopted and used widely across the country. In public services, AI boosts efficiency and effectiveness in areas like healthcare, transportation, and urban planning, showing its substantial impact on everyday life and public infrastructure. China's welcoming and open mindset towards AI significantly impacts its startups and established companies by creating a supportive environment for innovation and growth. The government's integration of AI into public services further provides practical platforms for startups to showcase and test their technologies.

In the US, AI development is driven by strong government involvement and a lively industry scene. The federal government is actively integrating AI into its operations to enhance public services.(AI.gov, 2024) Furthermore, there is a significant emphasis on AI education and research, with initiatives aimed at developing a skilled AI workforce and sustaining America's technological leadership.(Artificial Intelligence for the American People, n.d.)With the government's heightened emphasis on AI, startups might find more opportunities to secure government contracts or form partnerships.Government reduced the barriers for innovation by offering guidance on AI governance and promoting the development of suitable AI technical standards, the initiative aims to create a more supportive environment for startups to develop and implement their AI technologies.Which highlights the diverse and fast-moving nature of the AI field in the US.

(4)Technological:

US:

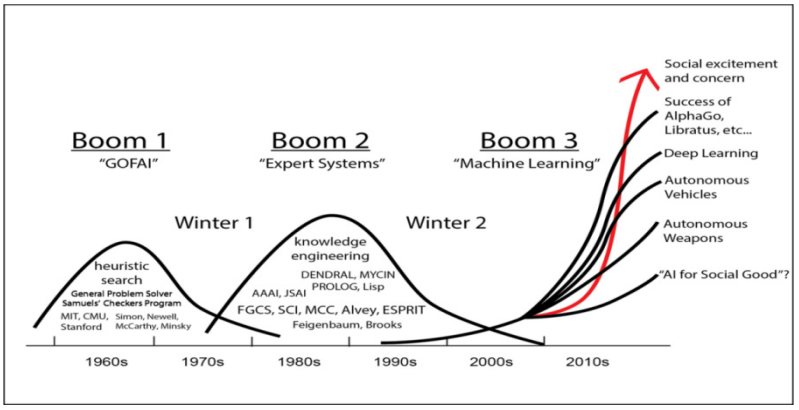

Figure 1: history of AI development in US sources:(Garvey, 2018)

Chinese:

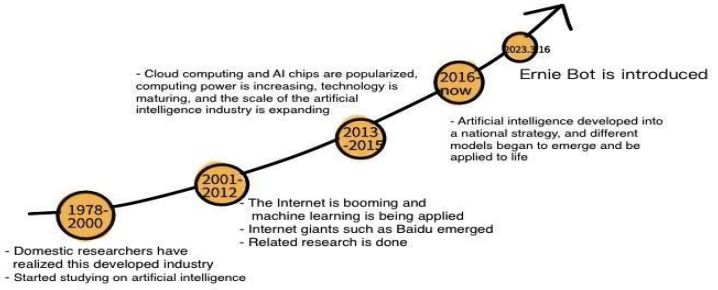

Figure 2: history of AI development in China Sources:(Sina, 2020)

As shown in the graph, the American AI industry experienced the first boom by the 1980s, which is the pioneer of the world. After that, the AI industry experienced two recessions and two bursts in America. During this period, the American AI model became mature, and more advanced technology was introduced. The AI machines were transferred from knowledge engineering to neural network-based algorithms, this industry also received a lot of social attraction and excitement. Numerous AI companies came out in Boom 3 including Chat GDP and Google Gemini.

Compared with the development of the AI industry in America, Chinese AI research not only started late, but the development road is also torturous. Related research began in the 21st century and many researchers and national leaders started to be aware of the importance and potential of the AI industry. The history of AI in China is much shorter than in America.

In addition, the history of LLM technology in America is longer than LLM technology in China. Back in 1966, the world's first chatbot, Eliza, was released by Joseph Weizenbaum of the MIT.(Baidu (BIDU) - market capitalization 2024) Eliza can reply to people but actually did not understand human's words, so it is not an LLM. But Eliza brought the desire that chatbot was able to talk like human motivated significant innovations in chatbot technology and invented LLM. (Sohsah, 2023) After that, Americans keep inventing LLM and applying it to real life.

In conclusion, the Chinese AI industry is far younger than in America, and many technologies should be exploited. However, Ernie Bot is not affected by it. Actually, Baidu quickly followed the trend of a large language learning model and built the advanced Ernie Bot. Meanwhile, it chooses the right time to enter the market which contributes to Ernie Bot's success. On the contrary, although the AI market in the United States has matured early, the timing for Goggle Gemini is not appropriate. They need to compete with other mature competitors and also suffer from the possibility that the AI industry in America is experiencing a transition.

8. Conclusion

This paper used the PEST model to analyze the macro factors that affect two fast followers of ChatGPT—Ernie Bot and Google Gemini. The US market and Chinese market

ISSN 2959-6130

both invested a lot in the AI industry which shows their concern on this growing industry. The AI industry in China benefits from strong governmental support and strategic integration into public infrastructure, creating a fertile ground for growth and innovation. In the US, a dynamic and diverse landscape driven by education, research, and private sector collaboration fosters a robust environment for AI advancement. These differing societal approaches provide unique opportunities for AI companies to thrive in their respective countries.

The political environments in both China and the US play a crucial role in shaping the growth of AI startups in each country. In the US, flexible regulations and market-driven policies encourage innovation and help maintain its leadership in the AI industry. In contrast, China's strict data privacy laws and censorship rules create challenges but also open up opportunities for local AI companies to innovate and address market gaps. Meanwhile, Chinese's AI technology is younger than America's and it has a shorter history. But Ernie Bot used its advantage to overcome these difficulties and gradually built upon ChatGDP in China. Micro factors including competitive advantage and market strategy were included in this paper. A large amount of investment from its developers enabled Baidu to contribute to a mature and advanced AI model. Baidu's developers' large database and brand advantage enabled Ernie Bot to gradually rank first in the Chinese AI industry. It also chose a time when ChatGPT was not widely used in China to enter the Chinese market. Furthermore, being built on Chinese data and made for the Chinese speaker, also contributed to Ernie Bot's success.

On the other hand, American AI technology has already experienced several times of expansion and recession. The LLM technology in America also has a longer history than that in China. However, mainly due to its technology problem including sometimes generating wrong images, Google Gemini does not do as well as Ernie Bot. This may be due to fewer investments resulting in immature technology and rush to launch this model to compete with other AI models. Meanwhile, Google Gemini chooses a time when the American market is already full of all kinds of AI products, in particular, ChatGPT already has a large market share. Google Gemini now faces challenges.

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