Investment Analysis on the Autonomous Vehicle Technology Company Under Covid-19 Pandemic:
A Case Study on Pony.ai Company

Kaicheng Jiang [1, †]   Wanying Huang [2, †]   Yunran Liu [3, †]   Xinyi Wei [4, *, †]

[1] *Kang Chiao International School, Suzhou City, Jiangsu Province, China*
[2] *School of Earth and Environment, University of Leeds, Leeds, LS2 9JT, United Kingdom*
[4] *Department of Business and Management Studies, Lancaster University Management School, Lancaster University, Lancaster, LA1 4YW, United Kingdom*
[3] *School of Social Sciences, University of Manchester, Manchester, M13 9PL, United Kingdom*
[*] *Corresponding author. Email: xinyi.wei@student.manchester.ac.uk*
[†]*These authors contributed equally.*

ABSTRACT

This paper studies the investment prospect of the autonomous vehicle technology company using the case of Pony.ai company. We apply the Political-Economic-Social-Technological (PEST) analysis to analyze the macroenvironment and the People-Context-Deal-Opportunity (PCDO) framework to evaluate the investment prospects of Pony.ai. We find that the autonomous vehicle industry has great prospects of development under the Covid-19 pandemic, and Pony.ai is a startup with great potential. Thus, Pony.ai is worthy of being invested by venture capital investors. Furthermore, our research enriches the PEST analysis and POCD framework application in investment analysis under the Covid-19 pandemic.

Keywords: PEST analysis, POCD framework, Automated vehicle, Covid-19 pandemic

1. INTRODUCTION

In the 21st century, the human-technology level has been progressing rapidly more than ever, and the productions in human society are moving from man force to machines. However, machinery that still needs manual operations may still be insufficient for humans' future development; therefore, more and more technicians are going into machinery automation. Then artificial intelligence technology (AI) is introduced and then comes to the front stage. Artificial intelligence means that after development in computer systems, they could perform tasks that normally require human intelligence [1].

With the development of modern artificial intelligence technology, new industries and companies emerge, and they are various in different areas, for example, facial recognition, chatbots, digital assistance. These new entities persist in changing the world and have become the new targets that attract individual investors and investment firms. In 2020, total corporate artificial intelligence investment reached 67.85 billion

US dollars, and this number was only 12.75 billion in 2015 [2]. This enormous number and the rapidly growing trend could show the popularity of AI among investors and the potential within that attracts these investors.

Within artificial intelligence technology, autonomous driving seems to be the most popular technology most people focus on and expect every day. And not only for customers but also for investors, they are looking forward to making a profit in this newborn technology with unlimited perspective.

Pony.ai, an artificial intelligence technology company that emerges through the new AI technology revolution. It specializes in autonomous driving technology and has developed rapidly through multiple financing rounds and cooperation during the past few years. However, since Pony.ai is currently not releasing its products to the global market at a large scale, its current survival is mainly based on investments. Originally, the company and the industry were prosperous at a stable pace. However, in 2019 and 2020, the global Covid-19 pandemic seems to change and

makes the investment environment vague and uncertain.

This research uses PEST analysis and POCD framework to investigate whether Pony AI is worth investment. This paper provides an insight into investment analysis of Pony AI under the impact of the Covid-19 pandemic and gives suggestions on future investments towards Pony.ai. Generally, this research concludes that it is worthy of investing in Pony.ai even under the effect of the Covid-19 pandemic.

Section 2 describes the detailed information of Pony.ai and introduces the methods used in the investigation: PEST and POCD frameworks. Finally, section 3 gives explanations in detail of the investigation towards Pony.ai using PEST and POCE frameworks. At the end of this research, a conclusion about the future investment perspective towards Pony.ai is given based.

2. METHODS AND FIRM DESCRIPTION

2.1 Company Introduction

Pony.ai Inc. ("Pony.ai"), founded by James Peng and Tiancheng Lou in Silicon Valley, America, in late 2016, is a high-tech company with world-class autonomous driving technology, a pathfinder in the field. This company is committed to providing a safe, advanced and dependable full-stack technical solution for driving automation level 4 (L4) to revolutionize the future of transportation systems – creating "Virtual Drivers" for all vehicles which can master a large number of road scenarios.

Both the Society of Automotive Engineers (SAE) International and the National Highway Traffic Safety Administration have announced standards about levels of driving automation that divide all autonomous cars into six levels according to autonomy. The highest level of Pony.ai's driving automation (L4) conforms to the "Levels of Driving Automation" standard released by SAE International. Table 1 explains different levels of autonomy in vehicles according to SAE International.

Table 1. Levels of Driving Automation

Level of automation	Narrative definition
Level 0. No Automation	Zero autonomy; the driver performs all driving tasks.
Level 1. Driver Assistance	The driver controls the vehicle, but some driving assist features may be included in the vehicle design.
Level 2. Partial Automation	The vehicle has combined automated functions, like acceleration and steering, but the driver must remain engaged with the driving task and monitor the environment at all times.
Level 3. Conditional Automation	The driver is a necessity but is not required to monitor the environment. However, the driver must be ready to take control of the vehicle at all times with notice.
Level 4. High Automation	The vehicle is capable of performing all driving functions under certain conditions. In addition, the driver may have the option to control the vehicle.
Level 5. Full Automation	The vehicle is capable of performing all driving functions under all conditions. In addition, the driver may have the option to control the vehicle.

Pony.ai has established four Research and Development (R&D) Hubs in Silicon Valley, Beijing, Shanghai and Guangzhou, China, respectively, starting from China and the United States. With the latest breakthroughs in artificial intelligence technology, Pony.ai partners with Toyota, GAC Group, and many other international and domestic first-class car factories and continues to provide its technology worldwide. Pony.ai has conducted a huge number of complicated scenario tests for its autonomous driving. The total global testing distance has exceeded six million kilometers, which is the foundation of large-scale autonomous driving services later.

Since the establishment of Pony.ai, its achievements have earned it recognition from the industry, and much honor has been satisfied. For example, Pony.ai has been listed on the Leading Autotech 50 companies released by KPMG China four times since the list was published.

What is more, Pony.ai is the first company to launch a public-facing Robotaxi service, PonyPilot, in both China and the US in the world. Later, it soft-launched the service in several cities. Finally, in April 2021, Pony.ai upgraded PonyPilot+ and expanded its service operations into five cities in China and America, including Guangzhou, Beijing, Shanghai, Irvine in California and Fremont.

In addition, Pony.ai began regularly testing driverless vehicles without human safety drivers behind the wheel in China and America. Also, some of those fully autonomous vehicles joined the self-driving cars fleet offering Robotaxi service on public roads in Guangzhou and started testing simultaneously.

2.2 The financing history of Pony.ai

By now, Pony.ai has raised over $1.1 billion from investors and become one of the most valuable autonomous driving companies globally at an over $5.3 billion valuation. Moreover, its major investors include Toyota Motor Corporation, Teachers' Innovation Platform (TIP) of Ontario Teachers' Pension Plan

(OTPP), Sequoia Capital China, International Data Group (IDG) Capital, Wuyuan Capital (5Y Capital, formerly known as Morningside Venture Capital), Legend Capital. Table 2 represents the financing history of Pony.ai. Columns (1) – (3) show the financing rounds, the investment amount per round and main investors in each round, respectively. In 2016, Sequoia Capital China and IDG Capital helped Pony.ai closed a seed round of $15 million in exchange for 20% equity. Then in January 2018, Morningside Venture Capital and Legend Capital led a $112 million Series A funding round in Pony.ai. Six months later, in July of 2018, Pony.ai announced a $102 million funding round and closed the Series A funding round. Furthermore, just like the last financing round, there were also some lead investors and follow-up investors. This round was led by ClearVue Partners and Fidelity China Special Situations PLC. It is worth mentioning that IDG Capital and Sequoia Capital were seed investors in Pony.ai and also joined the company's $112 million Series A funding round in 2018. In February 2020, Pony.ai raised $462 million in Series B funding round, including $400 million from Toyota Motor Corporation. In November 2020, as the lead investor, OTPP in Canada joined Pony.ai's Series C round. After raising $267 million, the valuation of Pony.ai exceeded $5.3 billion. As of February 2021, Pony.ai has raised $367 million and closed the Series C round.

Table 2. The financing history of Pony.ai.

Round	Amount	Investors
Seed	$15 million	Sequoia Capital China, IDG Capital
Series A	$112 million	Morningside Venture Capital, Legend Capital
Series A+	$102 million	ClearVue Partners, Fidelity China Special Situations PLC, IDG Capital, Sequoia Capital
Series B	$462 million	Toyota Motor Corporation
Series C Series C+	$267 million $100 million	Teachers' Innovation Platform (TIP) of Ontario Teachers' Pension Plan (OTPP); Brunei Investment Agency, CPE

2.3 Methods

2.3.1 The introduction of PEST analysis

PEST analysis is generally considered a practical and systematic analytical tool. PEST is a combination of the first letter of four key elements of the macro-environment in which companies are operated: political, economic, social, and technological. It examines the long-term impact of these four external forces on a company's competitive power at a given period. After assessing these factors, venture capital investors can make better investment decisions.

This study applies PEST analysis to evaluate opportunities and threats of Pony.ai's business due to macro-economic factors under the Covid-19 pandemic. In addition, a new investment analysis of Pony.ai is developed based on the PEST method.

2.3.2 The introduction of POCD analysis

POCD analysis is a framework used to identify the main strengths and weaknesses of a company. The POCD analysis consists of four key factors: people, opportunity, context, and deal. It is a micro-environment analysis and mainly investigates the factors closely linked to the company or within the company.

This study utilizes the POCD analysis to give an overview of the main operating elements of Pony.ai and develops a detailed understanding of the company itself to provide reliable investment suggestions.

3. INVESTMENT ANALYSIS

3.1 PEST analysis

3.1.1 Political environment

3.1.1.1 Nansha, Guangzhou, China

In May 2017, Nansha hosted the "Guangzhou Artificial Intelligence Roundtable." At the meeting, it was pointed out that the planned area of the Nansha Qingsheng Free Trade Zone would be about 3000 acres of AI industrial park. The planning and construction of the industrial park are led by the government, with state-owned enterprises as the main body, promoting the implementation of the AI industry and building an AI scenario test base, which will become a strong support factor for Pony's development prospects

On March 1, 2021, Nansha District, Guangzhou, signed a framework cooperation agreement with Pony.ai and the Chinese Academy of Sciences Smart City (Guangzhou), aiming to promote the integration of vehicle perception in autonomous driving and the construction of a smart city management platform. All roads in Nansha's planned open area will be tested for autonomous driving. In addition, an autonomous driving test base will be built in Qingsheng to promote the construction of a road test demonstration zone for intelligent networked vehicles.

The Nansha government will support the construction of special road sections with 5G and automotive sensor systems to meet the needs of high-level autonomous driving. It will also collect relevant data on vehicles, roads and people collected by Pony.ai and CAS Smart City to make the area smarter.

Pony chose one of the largest cities in China that supports artificial intelligence research and the development of autonomous driving technology as its base. Government support and public feedback indicate that autonomous driving technology will become the mainstream of society. As a Chinese company, Pony.ai has received stable support and a development environment in the Chinese market. Therefore, their research, innovation, and plans to promote products to the public will be supported and assisted.

At this time, China is developing rapidly in high-tech electronics, and the popularization of 5G technology can also become a big boost for Pony's development. At the same time, as one of the largest markets globally, China has high-quality social and customer samples for experimentation and reference [3].

3.1.1.2 California, USA

"As we all know, the autonomous driving industry is heavily restricted by government policies, licenses released by the government department are essential for these companies to perform road tests, also for different scenarios, like highways, city roads, which require different licenses from the government." Pony.ai's co-founder and CTO Lou Tiancheng said in a speech on July 29.

At that time, there was no relevant domestic policy to support autonomous vehicle road testing. At the 2017 Baidu AI Developers Conference, Robin Li, the founder, chairman and CEO of Baidu, once broadcasted a scene of himself riding in a driverless car through a live video, but targeted by traffic police fined 200 yuan and deducted 3 points.

Pony.ai, a Chinese self-driving car startup, has obtained permission from the California Department of Motor Vehicles to test its self-driving cars on specific streets in three cities without the need for human safety drivers to drive [4].

Since 2017, Pony has been approved to test safe-driving self-driving cars in California. However, the new license will operate in Fremont in Alameda County, Milpitas in Santa Clara County, and Irvine in Orange County. Six self-driving cars that did not drive safely were tested on specific streets. According to the DMV, these vehicles are designed to travel on roads with a speed limit of 45 miles per hour or less in clear weather and light rain. The first test was conducted in Fremont and Milpitas from 10 am to 3 pm on weekdays.

So through hard work, in June 2017, Pony.ai obtained the California drive test license. The United States has an open system, and local support also means that it has entered the international market and can cooperate and compete with more developers and research companies, which will expand Pony's influence and visibility around the world.

Autonomous driving for road testing Pony has completed road tests in China and the United States and got excellent road test results. Their Robotaxi, also known as self-driving taxis, has already begun to enter the market first. The government is looking forward to the popularization of artificial intelligence and driverless technology. They maintain an open and supportive attitude to Pony's team and products. Pony's products can try to occupy a place in the market. Their development prospects and products are in line with social development. Mainstream and government expectations [5].

3.1.2 Economic environment

Pony AI mainly focuses on the US and the Chinese market, opens branches in both markets, conducts road tests, and forms cooperations in both countries. At the beginning of the Covid-19 pandemic in 2020, both countries' economies were adversely influenced, and the world's economy fell into recession. Figure 1 shows that in 2020, most areas had a negative number in their annual percentage changes in real GDP, indicating a fall in general economic output levels and general income levels and displaying a potential of worsening general economic states and future recessions. As for the two main markets for Pony.ai in 2020, China has a rather low real GDP growth, and the United States has a negative real GDP growth. Therefore, the general economic states in the two markets were not looking optimistic for Pony.ai.
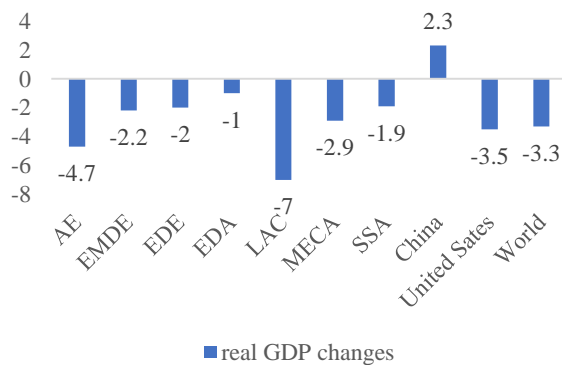

Figure 1. Real GDP per cent change at the early stage of Covid-19 in 2020

Source: International Monetary Fund - World Economic Lookout. Note: AE = Advance economies; EMDE = Emerging Market and Developing Economies; EDE = Emerging and Developing Europe; EDA = Emerging and Developing Asia; LAC = Latin America and the Caribbean; MECA = Middle East and Central Asia; SSA = sub-Saharan Africa.

However, in 2021, the invention of the Covid-19 vaccine helped to open up the stagged global economy. Also, the halt of home quarantine and lockdown policies

has made many businesses re-open. Thus, the global market starts to recover even though the pandemic is not completely over. During this recovery stage of the global economy in 2021, improvements in the economic states around the world are visible. According to Figure 2, most countries around the globe in 2021 achieve positive real GDP growth rates, which could be added as a comparison to Figure 1, proving that most countries in the world are recovering. As for China and the United States, both nations achieve a real growth rate above 6%. Compared to 2020, the changes in real GDP growth rates in both countries are greater than 4%.
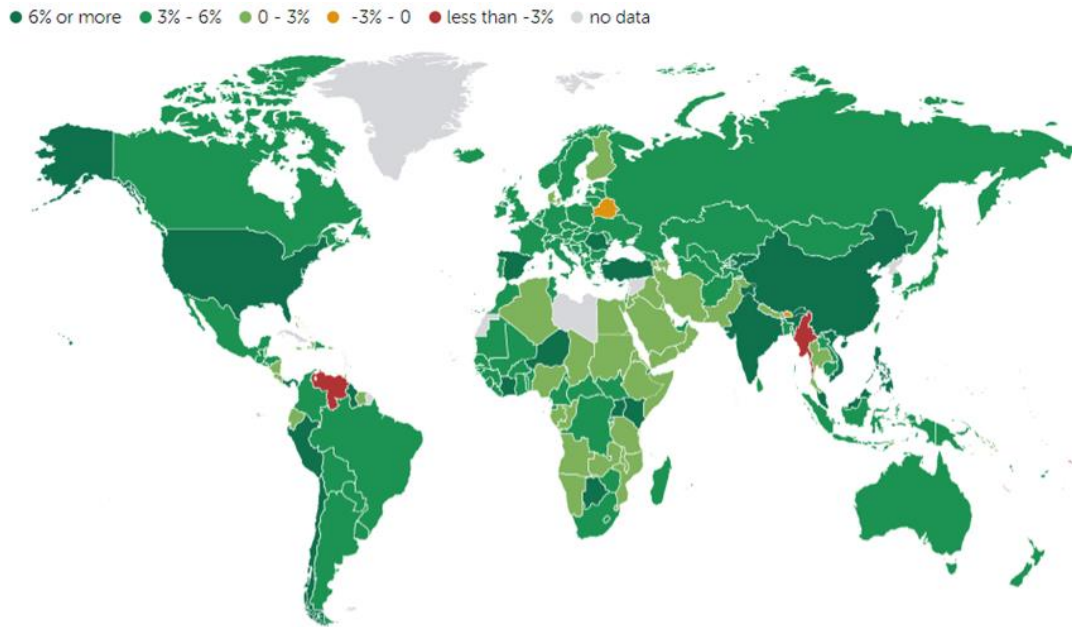

Figure 2. Real GDP per cent change of all the countries at the late stage of Covid-19 in 2021

Source: International Monetary Fund - Real GDP Growth.

These numbers mean that the two nations' economies are growing and expanding faster, and they could also show that these two countries are getting richer, and people earn more money than in 2020. It is a huge improvement in the potential markets for Pony.ai.

Car ownership rate is also considered to be a part of the economic factors. The two main markets that Pony.ai operates both have high car ownership rates. As for China, its car ownership rate was 71.43% in 2019 [6], and in the United States, at least 91.3% of households will have access to at least one vehicle in 2021 [7]. These high percentages of car ownership indicate high reliance and solid demand towards vehicles in China and the United States. Therefore, these two markets could provide potential customers for autonomous driving vehicles. Also, the GDP per capita in China and the United States are important for Pony.ai to launch their driverless cars since this determines whether the customers can afford them. In 2020, the GDP per capita of the United States was $63,543.6, and that of China is $10,500.4, while the world average is $10925.7 [8]. With China's GDP per capita is around the global average and the United States' GDP per capita is far above the global average, the result is clear that Pony.ai would have enough customers with sufficient financial capacity to buy driverless cars.

The recovery of economies at the late Covid period also boosts the activities relating to investments. During the pandemic's peak, venture capital firms were concerned about the risks brought by the pandemic, which influenced their investment choices. As Figure 3 shows that in 2020, both investment amount and deals were at a rather low level. In 2021, venture capitalists are becoming more vibrant by conducting more deals and eventually investing more money.
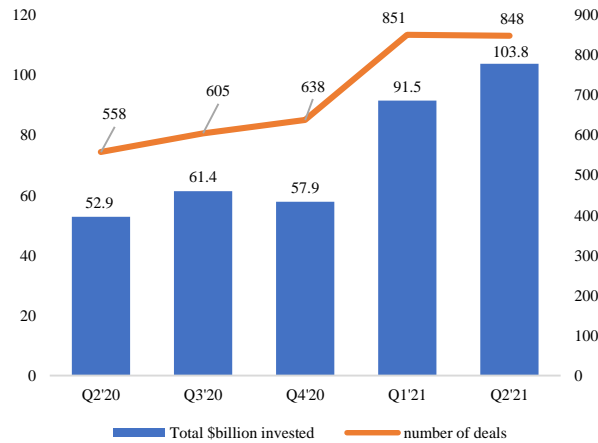
Figure 3. Global late-stage and technology growth investment from the early stage to the late stage of Covid-19

Source: Crunchbase News - Global Venture Funding Hits All-Time High in First Half Of 2021, with $288B Invested.

The recovery of economies makes the VCs more willing to invest, and for Pony.ai, this would also become an opportunity to catch. The activeness of VCs is beneficial for Pony.ai since Pony.ai is currently continuing its technological innovation and the main cash flows that help it survive are investments. To gather more funds for the technology and attract these active VCs, Pony.ai would need to show more remarkable progress in their technology. Therefore the company itself would be motivated to innovate faster and quicker. Conclusively, the recovery of economies would motivate the VCs to invest then motivate Pony.ai to have further achievements. Simultaneously, these achievements could be seen as Pony.ai is approaching future profit for the VCs, and they are more willing to invest. It is a mutually winning occasion. Therefore, this recovery stage is the most appropriate time for VCs to see the potential lies in Pony.ai and invest in it.

3.1.3 Social environment

When one product launches, one crucial factor in determining its success is its social acceptance. Autonomous driving technology has always been controversial in many societies, and many people hold different attitudes towards it. These attitudes could be categorized as positive and negative. However, the data displayed in Figure 4 is very inspiring. More people have positive emotions than negative emotions towards autonomous driving vehicles in all countries except for the United Kingdom. This result also applies to the overall situation of emotions. While in the United Kingdom, the percentage of people who have positive emotions and negative emotions are generally the same. As for the two main markets that Pony.ai focuses on, over a majority of people investigated in China have positive emotions towards autonomous driving vehicles, which is a delightful result for Pony.ai, which shows a high level of social acceptance and potential for success.
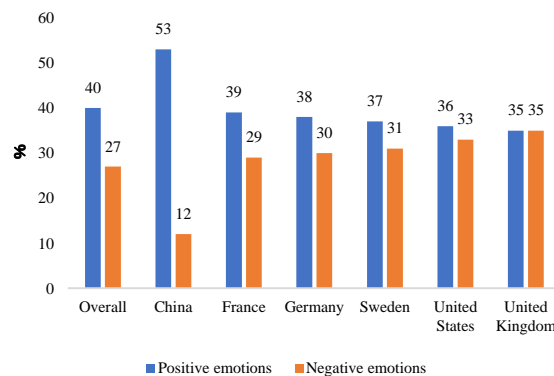

Figure 4. Emotions evoked by autonomous driving vehicles

Source: Capgemini - The autonomous car, a consumer perspective.

Different lifestyles as a social factor could also be a major issue to influence one company's product. As mentioned above, China has a high car ownership rate of 71.43%, and one essential reason is that in some scenarios, Chinese people regard vehicles as a representation of status and wealth [9]. Therefore, there

is a possibility that Pony.ai's autonomous driving cars would become the new symbol of status and attracts customers in a rather abnormal way by giving them a sense of pride.

3.1.4 Technological environment

With the Covid-19 pandemic, most businesses stopped running, and some of them were forced to closed down due to the low earnings with barely any customers. However, for Pony.ai, their technological development has not been put off by the lockdown. Pony.ai develops its own L4 autonomous driving technology, which is currently the highest level of AI technology for driving, and it does not heavily rely on manual operations. This technology ensures that they could still perform road tests in China and the United States during the lockdown and maintain their process. Pony.ai even sought opportunities within the lockdown to test and utilize their technology in a more ingenious way. For example, it cooperates with Yamibuy, an e-commerce website, to deliver packages to customers in Irvine and California using Hyundai cars equipped with Pony.ai L4 autonomous driving technology. This cooperation was a huge success, with 500 to 700 packages delivered per day [10]. This move also suggests that Pony.ai is not far away from putting into large scale operation, for investors, they would not wait long for their investment to pay back.

For technology companies like Pony.ai, the patent is also an important factor for their future developments. So far, Pony.ai has applied for 109 patents, 107 patents are valid, two patents are turned down [11]. Pony.ai and its branch department initially invented these patents without any third party involved. Some are owned by Pony.ai and then transferred to the branch department, but still within the Pony.ai group. The patents vary from different areas, from exterior design to technology development to car parts manufacture. The patents Pony.ai owns are quite comprehensive and cover all the areas related to autonomous driving cars. Also, this perceives that Pony.ai would not likely be involved in patent disputes and further related lawsuits. As for investors, this provides a stable and trustworthy image.

3.2 POCD analysis

The POCD analysis originally should include an analysis of a company's deal. However, specifically, in this case, Pony.ai has not launched its final product to the public yet. Therefore it is impossible to analyze the deals of Pony.ai. So, this research does not contain an analysis of deals.

3.2.1 The People

The three core members are James Peng, Tiancheng Lou and Andrew Yao, a computer scientist and

academician who serves as chief adviser. The core business of Pony.ai is autonomous driving with artificial intelligence technology, and the three core members have professional technology, which lays a foundation for the development of the company's core business.

Dr. Lou graduated from Tsinghua University and won many awards in well-known international program design and programming competitions. He is the youngest T10 level employee (a baidu's ranking of technical personnel, T10 employees are extremely representative technical talents) of Baidu. James Peng is a Stanford graduate who is dedicated to solving challenging problems in future mobility. He has worked for Baidu and Google for 11 years and has excellent insights and knowledge of artificial intelligence and experience in company management. Dr. Yao, a world-renowned computer scientist, currently serves as professor and President of the Institute of Interdisciplinary Information Sciences (IIIS) at Tsinghua University and is a member of the Chinese Academy of Sciences and the National Academy of Sciences of the United States of America. He holds a Ph.D. in computer science and a Ph.D. in physics from several prestigious universities. With the support of a group with abundant professional knowledge, Pony.ai has a high guarantee in technical aspects.

In addition to professional knowledge, other aspects are also necessary. In terms of personality, the three founders are innovative and draw on the advice of a vast pool of talent, using their expertise to select these electronics. On the other hand, founders are good at discovering their talents, communicating with people, and combining their wisdom to create this brand.

Therefore, due to the outstanding expertise of the three founders, Pony.ai's technology has been strongly guaranteed. Furthermore, absorbing a large number of talents from other aspects, such as finance and management, has enhanced the efficiency of the internal operation of the whole brand.

3.2.2 The Opportunity

In early 2020, the new outbreak, most countries began to restrict travel, most residents could only stay at home in such cases, the rise of the food industry to Pony.ai a business opportunity. Until then, the delivery industry still needs delivery men to deliver supplies. Pony.ai's ai-powered "last mile" delivery service eliminates delivery altogether and instead uses all-electric fleets of autonomous vehicles to deliver residents' daily necessities to their doorways. Artificial intelligence certainly reduces person-to-person contact and reduces the possibility of transmission of the virus.

The founders of Pony.ai were initially inspired by the growing traffic jams and the difficulty of parking. Autonomous driving can enable artificial intelligence to

serve human beings and shorten people's time for inconvenient transportation. In addition, the 2020 pandemic has increased the demand for artificial intelligence and driverless vehicles. Therefore, Pony.ai's success is not only because it solidified the expertise of the three creators in contact but also because it is a necessary product of The Times.

3.2.3 Context

Table 3 shows seven main competitors of Pony.ai [12 - 15]. We can find that the most mainstream solution in family cars is still L2 autonomous driving. Even Google and Baidu have directly deployed L4 autonomous driving, but they still struggle on the road to commercialization. The technology circle also commented on the resignation of Waymo CEO as "declaring the end of an autonomous driving era." The dominant position in the market is still L2-L2.5 level vehicles, which also shows that the popularity of L4 level autopilot technology in the market is very low, and the opportunity is great.

Table 3. The development and research results of some companies in the field of artificial driving in the market

Company	The development and research results
Toyota	Commercial L2
Tesla	Commercial L2.5
Xiaopeng	Commercial close to L2.5
BIDU	The L4 solution was launched in January 2021, but it has not yet been commercialized
NIO	Commercial L2
Waymo(Google subsidiary)	L4 commercialization is not going well. CEO resigned on April 2, 2020
Cruise(General Motors)	L4 self-driving car launched in January 2020, but not mass production

PricewaterhouseCoopers pointed out that: L4 autonomous taxis are one of the largest subdivisions of autonomous driving, but the L4 market will gradually form a commercial landing in 2025. Although self-driving taxis can increase the long-term profits of the overall business model, the business model will still take a long time to land due to the high technical threshold. As a result, many companies have focused their attention on profitable vehicles such as L2 level autonomous driving technology or L2.5 level autonomous driving technology, allowing Pony to lead L4 autonomous driving technology.

Pony.ai focused on L4 autonomous driving technology and developed PonyAlpha X. PonyAlpha X was released in November 2020. It is the first automated driving software and hardware system produced by Pony.ai. The system can achieve a full field of view of 200 meters. Blind compensation lidar and left

millimeter-wave radar are used to eliminate blind spots and improve the system's processing quality and response speed for various long-tail scenes. In addition, the human-computer interaction interface has been completely renewed. Ensure the efficiency of large-scale drive testing and technology research and development and provide a high-quality travel experience.

While supporting hard power, Pony.ai will also put the product into use as soon as possible. Pony.ai conducted multiple road tests. They have a professional team with clear goals and a vision for the future, which gives them many initiatives in the future L4 autonomous driving technology market. They will give priority to building credibility and customer base.

L4 autonomous driving technology has much room for development and opportunities in large transportation and trucks. In port operations, cargo ships load and unload cargo at the port. The containers are stacked neatly and tightly, and the terminal facilities are not open to the public, which reduces many interference factors. Secondly, the highway conditions are relatively simple, and there are no interference factors such as traffic lights and pedestrians. Therefore, the closedness and environmental control in the two scenarios are consistent with autonomous driving technology. More importantly, in the long-distance cargo transportation scenario, the demand for autonomous driving seems to be greater. For example, long-distance truck drivers and supervisors have been seriously plagued by fatigue driving problems. This type of vehicle has a very high-risk factor, and the use of labor costs and risks are high. It is assumed that the long-distance freight yard can realize automatic driving on standard road sections, plus the driver takes over the "semi-automatic driving" scheme, trucks in the last few kilometers. In this case, the driver is expected to break free.

In the current social environment, the outbreak of the epidemic has also brought a certain impact to the market. In this special period, people's demand for autonomous driving technology has increased. In this special period when reducing physical contact between people and maintaining social order becomes particularly important, autonomous driving technology will contribute to the social order under the epidemic. Furthermore, under the influence of the epidemic, high-tech by-products have ushered in rapid development, such as online shopping systems, community services, and online conferences that have further entered people's ordinary lives, accelerating the popularity of high-tech products and software in society. This phenomenon also promotes introducing technology products such as autonomous driving into society and their rapid popularization.

4. CONCLUSION

This study applies two business analysis models to

study the feasibility of venture capital investment in the autonomous driving startup, Pony.ai, under the Covid-19 epidemic. First, using the PEST analysis technique, we evaluate the external factors of Pony.ai in the business environment. Second, with POCD analytical framework, we identify the main strengths and main weaknesses of the company.

Generally, we find the Covid-19 epidemic changes the external environment of Pony.ai, but overall these alterations offer an even brighter prospect of investing in Pony.ai to VCs. In terms of venture capital investors, Pony.ai still offers attractive investment opportunities. Our results demonstrate that the positive impact of the Covid-19 epidemic on the market is more pronounced in the autonomous car industry since autonomous vehicles can efficiently reduce physical contact between people. Economic factors analyses find that, at the late Covid-19 period, the recovery of economies stimulates VC investments and creates more financing opportunities for Pony.ai. Thus, at the same time, to raise more money to develop, Pony.ai will show its potential fully and make investors in with an excellent chance of evaluating whether it is a profitable investment.

This research might be meaningful in updating venture capital investment analysis after the Covid-19 epidemic. Furthermore, our paper can refer to potential venture capital investors of Pony.ai who hesitates to decide whether they should participate in the financing activities organized by Pony.ai.

REFERENCES

[1] 8 Helpful Everyday Examples of Artificial Intelligence, August 10, 2020. https://www.iotforall.com/8-helpful-everyday-examples-of-artificial-intelligence

[2] Global total corporate artificial intelligence (AI) investment 2015 to 2020, April 16, 2021. https://www.statista.com/statistics/941137/ai-investment-and-funding-worldwide/

[3] Policy Interpretation of "Guangzhou City's Five-Year Action Plan for Accelerating the Development of IAB Industry (2018-2022)". (n.d.). August 30, 2018, http://www.gz.gov.cn/zwgk/zcjd/zcjd/content/mpost_5527258.html.

[4] Nansha speeds up autonomous driving development. (n.d.). September 25, 2021, http://subsites.chinadaily.com.cn/guangzhou/nansha/2021-03/02/c_597614.htm

[5] Lyons, K. (2021, May 22). Chinese startup Pony.ai gets approval to test driverless vehicles in California. The Verge. September 25, 2021, https://www.theverge.com/2021/5/22/22449084/chinese-startup-pony-ai-autonomous-vehicles-california.

[6] YouTube. (2021, August 4). Mobility, reimagined. YouTube. September 25, 2021, https://www.youtube.com/watch?v=A-xWkGwZmZc.

[7] Car ownership rate in China 2019, May 12, 2021. Available at: https://www.statista.com/statistics/1028612/china-car-ownership-among-consumers/#:~:text=According%20to%20the%20survey%20conducted,stated%20they%20owned%20a%20car

[8] Car Ownership Statistics (2021 report), June 29, 2021. https://www.valuepenguin.com/auto-insurance/car-ownership-statistics

[9] GDP per capita (Current US$), n.d. https://data.worldbank.org/indicator/NY.GDP.PCAP.CD

[10] Chinese driverless car firm launches autonomous deliveries in California as lockdown continues, April 17, 2020. https://www.cnbc.com/2020/04/17/coronavirus-ponyai-launches-driverless-car-deliveries-in-california.html

[11] Pony AI patent, n.d. https://www.patentguru.com/cn/assignee/%E5%8C%97%E4%BA%AC%E5%B0%8F%E9%A9%AC%E6%99%BA%E8%A1%8C%E7%A7%91%E6%8A%80%E6%9C%89%E9%99%90%E5%85%AC%E5%8F%B8

[12] Corporation., T. M. (n.d.). Toyota motor Corporation OFFICIAL global website. September 25, 2021, https://global.toyota/en/.

[13] Electric cars, solar & clean energy. Tesla. (n.d.). September 25, 2021, https://www.tesla.com/.

[14] Electric cars, solar & clean energy. Tesla. (n.d.). September 25, 2021, https://www.tesla.com/.

[15] NIO official website. September 25, 2021, https://www.nio.cn/.