



**STUDY ON THE SUSTAINABLE DEVELOPMENT OF
SCIENTIFIC AND TECHNOLOGICAL PRIVATE ENTERPRISES
IN CHINA--TAKING BEIJING TIMELOIT TECHNOLOGY CO.,
LTD AS AN EXAMPLE**

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**AN INDEPENDENT STUDY SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE MASTER'S DEGREE OF BUSINESS
ADMINISTRATION GRADUATE SCHOOL OF BUSINESS
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This Independent Study has been Approved as a Partial Fulfillment of the
Requirement of International Master of Business Administration in International
Business Management

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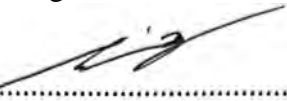
Title: Study on the Sustainable Development of Scientific and Technological Private Enterprises in China--Taking Beijing Timelait Technology Co., LTD., as an example

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ABSTRACT

China's economic development has gradually lost its advantages of demographic dividend and cheap labor, and China's economic development in the future can only rely on scientific and technological innovation and technological progress. Huawei, DJI, Tencent, Alibaba, and other top technology enterprises in China are all private enterprises, which is enough to prove the key role and important position of private enterprises in China's economic and technological innovation and technological progress, and private enterprises have become the main force of China's scientific and technological innovation and technological progress.

The objectives of this study were 1) To analyze the capital demand, financing channels, and strategies of sci-tech private enterprises; and 2) To explore and enhance the innovation ability of science-based private enterprises; and 3) To analyze the competitive strategy, market positioning and strategy adjustment methods of sci-tech private enterprises.

This paper takes Beijing Timelait Technology Co., Ltd. as an example. Through literature review, it found that 1) the company needs to develop continuously, it must strive to improve its financing ability and adhere to a market-oriented and flexible product strategy; 2) The company should improve its product quality and service quality, and to cultivate the core competitiveness of products in order to enhance the innovation ability of science-based private enterprises; and 3) the company need to enhance its own development potential, improve its product competitiveness, and enhance the corporate credit.

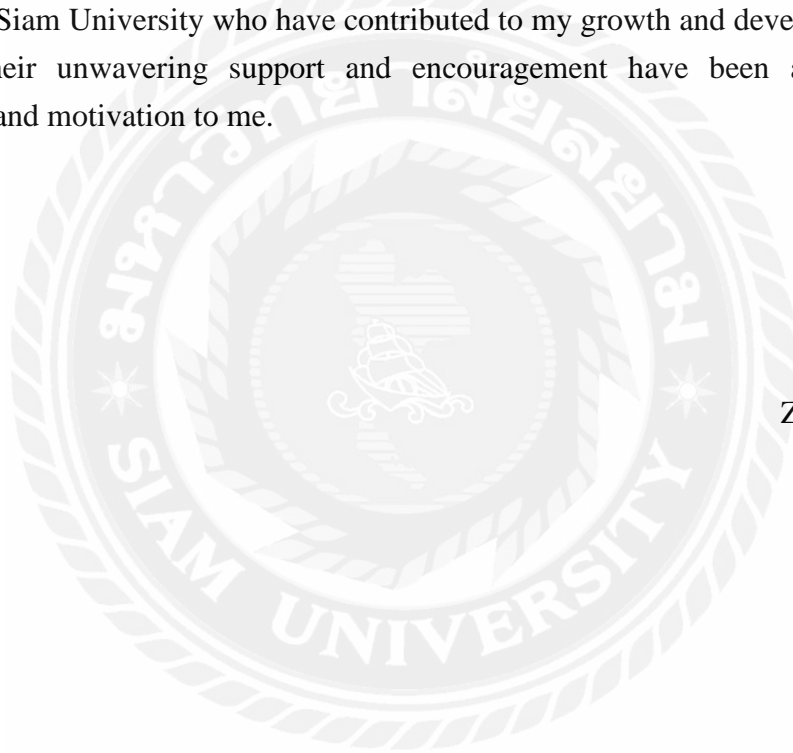
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Zhang Chong
2023.07.05

Declaration

I, Zhang Chong, hereby certify that the work embodied in this independent study entitled “Study on sustainable development of scientific and technological private enterprises in China--taking Beijing Timelot Technology Co., LTD., as an example” is result of original research and has not been submitted for a higher degree to any other university or institution.

Zhang Chong
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July 5, 2023



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1.Introduction

1.1 Research Background

Since the reform and opening up, China's private enterprises have gradually developed from scratch and become an important part of the Chinese economy. In 2021, the added value of private enterprises above designated size will increase by 10.2%, 0.6 percentage points higher than the average level of China. The import and export volume of private enterprises reached 19 trillion yuan, an increase of 26.7%, accounting for 48.6% of the total foreign trade, contributing 58.2% to the growth of foreign trade. It contributes 9.8 trillion yuan in tax revenue, accounting for 59.6% of the total tax revenue of enterprises, and can be comparable with state-owned enterprises and foreign-funded enterprises, becoming the main driving force of China's high economic growth (Gao & Xu, 2023). At the same time, the private economy has also played a positive role in the optimal allocation of China's resources, the employment pressure of the population, and the harmony and stability of the society. From this point of view, the status of the private economy in the national economy cannot be ignored, inject vitality into the development of the national economy and become the biggest source of power (Liu, 2021).

With the continuous progress and innovation of science and technology, the rapidly growing scientific and technological private enterprises have become an important force to promote the development of China's capital. Since the establishment of the socialist market economy was proposed, China's scientific and technological private enterprises have mushroomed like mushrooms, and some of them have gradually developed into large enterprises with high visibility, such as Jingdong Group, Alibaba, Huawei and so on. However, there are also some scientific and technological private enterprises like a flash in the pan, especially since the 21st century, the rapid development of scientific and technological private enterprises and their rapid shortening of life formed a strong contrast. Faced with repeated failures in management, entrepreneurs are in a dilemma. Where is the road? Seeking the path of sustainable development of enterprises has become an important topic of common concern of the business community and the theoretical community (Liu, 2018).

The sustainable development of scientific and technological private enterprises mainly depends on the continuous innovation and development of technology. However, the current technological innovation only stays in the general innovation activities, and has not helped enterprises to obtain stable and sustained economic benefit growth, nor has it been able to help enterprises get rid of the difficulties encountered in the development. Therefore, the research purpose of this paper is to explore the deep meaning of the sustainable development ability of science and technology private enterprises and evaluate the sustainable development ability of science and technology private enterprises, which has important practical significance and theoretical value for the sustainable development of science and technology private enterprises (Liu & Chen, 2017).

Based on Porter's theory, this paper explores the factors influencing the sustainable development of sci-tech private enterprises. Porter's theory is a theoretical

framework used to analyze and evaluate the competitive advantages and strategies of enterprises. Although Porter's theory is mainly concerned with the competitiveness and profit of enterprises, it can also be applied to the study of the sustainable development of enterprises. Porter's theory emphasizes the importance of gaining and maintaining competitive advantages in specific industries. Sustainable development is a strategic advantage that can provide companies with more long-term, stable and sustainable competitiveness. By analyzing the value chain, competitors and Porter's theory, enterprises are encouraged to achieve competitive advantage through innovation and continuous improvement of value creation ability. Sustainable development requires companies to innovate in product and service design, production processes and supply chain management to achieve a balance between environmental friendliness, social responsibility and economic viability. Porter's theory can help companies analyze and improve all aspects of the value chain to drive sustainability related innovation.

1.2 Research Problems

With the process of reform and opening up, China's scientific and technological private enterprises have shown a pleasant scene of vigorous development since their establishment, and made important contributions to the development of China's national economy. However, with the deepening of China's economic system reform and the acceleration of China's integration into the process of economic globalization, the drawbacks of scientific and technological private enterprises are gradually exposed, and management problems restrict their further development. Many scientific and technological private enterprises with good performance have disappeared or are on the verge of bankruptcy.

China's scientific and technological private enterprises generally have the problem of "short average life expectancy and high mortality rate" in the development, which is difficult to achieve sustainable development. The average life span of private enterprises in China is only 3.7 years, and the average life span of small and medium-sized enterprises is even 2.5 years. Less than 2% of private enterprises survive for more than 10 years (Liu, 2019). As an important branch of private enterprises, sci-tech private enterprises are more likely to be restricted by capital, technology, talents and other conditions than traditional large enterprises. In addition, in recent years, the national economic transformation, industrial structure adjustment, science and technology private enterprises are more vulnerable to impact.

Beijing Timelot Technology Co., LTD., as a science and technology private enterprise established 15 years ago, has won many honors such as the Luban Award of China Construction Engineering (National Quality Project), the first prize of Beijing Science and Technology Progress Award, the second prize of Tianjin Science and Technology Progress Award, and the second prize of Huaxia Construction Science and Technology Award. The continuous and stable operation of Beijing Timelot Technology Co., Ltd. has pointed out the development direction for many sci-tech private enterprises.

Therefore, it is a subject of practical significance to study the factors affecting

the sustainable development of China's scientific and technological private enterprises under the current situation. Scientific and technological private enterprises face the following problems in their development process:

1. Funding and financing difficulties: Compared with state-owned enterprises or multinational companies, private enterprises face greater challenges in financing. Due to the lack of stable funding sources and credit guarantees, it may be more difficult for them to obtain financing support, limiting their ability to develop sustainably (Yu & Wu, 2019).

2. Lack of technology and innovation capacity: Some private enterprises may face the problem of insufficient technology and innovation capacity. In high-tech and knowledge-intensive areas, technology and innovation capacity are key elements to drive sustainable development. Enterprises that lack independent innovation and core technologies may struggle to sustain development in a highly competitive market (Liu & Chen, 2017).

3. Market competition and market access barriers: Private enterprises face fierce competition from domestic and foreign enterprises in the market competition. There are market access barriers and unfair competition in some industries, which makes it more difficult for private enterprises to survive and develop in the market (Wang & Wang, 2017).

1.3 Objectives of the Study

The purpose of this paper is to understand the main characteristics of sci-tech private enterprises, and then analyze the problems in the development and management of sci-tech private enterprises.

1. To analysis the capital demand, financing channels and strategies of sci-tech private enterprises in the process of sustainable development, and how to overcome the capital pressure.

2. To explore and enhance the innovation ability of science-based private enterprises, promote technological innovation and solve related problems.

3. To analysis the competitive strategy, market positioning and strategy adjustment methods of sci-tech private enterprises in the changing market environment in order to maintain market competitiveness.

1.4 Scope of the study

Based on Porter's competitive theory and starting from the definition and connotation of sustainable development, this paper deeply discusses the characteristics of each life cycle of enterprises. After referring to domestic and foreign research results and consulting relevant materials, the previous research results are sorted out and summarized, and the key factors affecting the sustainable development of scientific and technological private enterprises are analyzed. Then, through the overall analysis of the industrial structure of Beijing Times Lingyu Technology Co., LTD., the competition environment is viewed from the "five forces model", and according to its development model, the sustainable development model suitable for sci-tech private enterprises is found.

The literature referred to in this paper mainly focuses on the period from 2018 to

2023. Different parties have different expressions and studies on corporate sustainable development, and each has its own focus, but the commonality is that the profitability and competitiveness of enterprises are the focus and important content of this research. From the literature review, there are a lot of research results on the constraints on the sustainable development of the private economy. Scholars have explained the factors hindering the further development of the private economy from different perspectives, and summarized the views of these constraints on the private economy. From the perspective of external environment, there are mainly several constraints: financial support system (financing problem); Technology and innovation capacity; Market access system (entry and exit).

Current research focuses on two aspects: the external environment faced by the development of the private economy and the defects faced by the development of private enterprises, and the research results are also mostly concentrated in these two directions. Building a research system of the private economy and then analyzing and solving the development problems of the private economy from the perspective of system evolution should be the direction of further research on this topic in the future. At the same time, the targeted and systematic research on the sustainable development of private enterprises is not enough, and the research results are still limited. Therefore, it is necessary to further strengthen the systematic, comprehensive and targeted research on the sustainable development of private enterprises, in order to provide theoretical guidance and help for the long-term healthy and sustainable development of private enterprises.

1.5 Research Significance

Based on the evaluation and analysis of Beijing Timelot Technology Co., LTD., this paper expounds the concept framework of sustainable development ability of sci-tech private enterprises from the perspective of sustainable development practice and theoretical research needs, combined with relevant theories of sustainable development and core competence of sci-tech private enterprises. Combined with the relevant knowledge of sustainable development evaluation index system and core ability evaluation, a set of relatively scientific and operable evaluation indexes of enterprise sustainable development ability is proposed to provide scientific guidance for the evaluation of enterprise sustainable development ability. The research of this paper has the following three significances:

(1) It is of certain practical significance for improving the core competitiveness of China's scientific and technological private enterprises and maintaining their competitive advantages of sustainable development.

The current enterprise performance evaluation index system is blind and too one-sided, enterprises only one-sided pursuit of their own profit growth, and constantly pursue short-term interests brought about blind expansion, resulting in the emergence of the "shareholder wealth maximization" management center of enterprises, resulting in unsustainable development of enterprises. This paper takes the research on the sustainable development ability of China's scientific and technological private enterprises as the starting point, studies the sustainable

development ability of enterprises, and puts forward corresponding policy suggestions from the theoretical height to ensure that the core competitiveness of China's scientific and technological private enterprises is improved. Therefore, the research on the evaluation of sustainable development ability of China's scientific and technological private enterprises introduced in this paper has certain practical significance.

(2) It further improves the theory of sustainable development ability, which has certain theoretical value for the evaluation of enterprises' sustainable development ability.

The current theoretical research on the evaluation of enterprises' sustainable development ability is still in the initial stage. After studying foreign references, it is found that systematic research on enterprises' sustainable development ability lacks detailed theoretical ideas, and the literature on the systematic research on the sustainable development ability of Chinese science-based private enterprises is not complete enough, and the number is small. Therefore, the research content of this paper has a perfect and rich theoretical value for the research of enterprise sustainable development ability theory.

(3) Provide reference and guidance for the sustainable development of China's scientific and technological private enterprises.

Nowadays, with the rapid development of knowledge economy, it is very important to study the sustainable development ability of enterprises to promote the better and faster development of China's sci-tech private enterprises. This paper explores and researches the sustainable development ability of Chinese science-based private enterprises, and puts forward measures and methods to better cultivate and improve the sustainable development ability of enterprises, so as to provide reference and guidance for the sustainable development of Chinese science-based private enterprises.

2. Literatures Review

2.1 Definition and characteristics of sci-tech private enterprises

2.1.1 Definition of private enterprise

The direction of China's economic and social development is dominated by economic construction. Among all enterprise organization forms, private enterprises are important new forces to promote China's economic and social development. Since the reform and opening up, private enterprises, along with the various stages of China's economic and social development, have experienced the changes of China's social system and various ideological changes, interest changes, market rules alternation and various contradictions and conflicts. The development of private enterprises records the details of the development of China's market economy. At present, there is still a great dispute about the connotation of private enterprises in the academic circle. Some people think that private enterprises should be defined in terms of capital source composition in the process of enterprise development. Therefore, private enterprise refers to the form and support of enterprise investment mainly from

private assets, including movable property, real estate and capital. Some scholars believe that private enterprises are actually enterprises without state-owned capital. In the process of studying related issues of private enterprises, we must clearly grasp the connotation of private enterprises, and carry out related research on this basis. Generally, the definition of private enterprises has two views in a broad sense and a narrow sense. In a broad sense, private enterprises are those that are not wholly state-owned enterprises. Therefore, private enterprises have a certain degree of independence. In a narrow sense, private enterprises belong to private enterprises or joint enterprises, which are bound to be subject to certain constraints in the development process (Lin, 2021).

Private enterprise is a combination of private and enterprise. There are many definitions of private enterprises, among which the broader definition is the view of American scholar Chandler (1987): "The founder of the enterprise and its closest partners (and the private sector) have always held most of the equity." They maintain close personal relationships with managers and retain the main decision-making power of senior management, especially in relation to financial policy, resource allocation and senior personnel selection." According to this definition, private enterprises not only include family enterprises with direct blood relations, but also include business forms established by blood, kinship, geography, business and human relations.

In fact, it is not only when ownership and management are completely and directly in the hands of private members that it is called a private enterprise. When a private enterprise or several private enterprises with close alliance relations have full or partial ownership, and directly or indirectly grasp the right to operate the enterprise, the enterprise can still be called a private enterprise. Therefore, private enterprises can be divided into three types: (1) the ownership and management rights are completely controlled by a private enterprise; (2) holding incomplete ownership, but still able to control the main management rights; (3) Holding partial ownership but basically not the right to operate.

2.1.2 Definition of science and technology enterprise

Science and technology enterprises refer to the output of products with relatively high technical content, with core competitiveness, and can constantly introduce new products in line with market demand, and constantly open up new markets. This type of enterprise can be generally divided into two categories: one is the usual sense, mainly engaged in electronics, information, biology, new materials, new energy and other scientific and technological industry products and technology development, application of science and technology enterprises; The other category is knowledge-intensive enterprises engaged in the development and management of supply chains or franchising based on customer preferences and information (Xiong, 2021).

In developed countries, there are two main standards to measure the technology industry. On the one hand, the research and development intensity of the enterprise is explained as the percentage of the research and development cost in the business income of the enterprise, and on the other hand, the percentage of professional and

technical employees among the employees. If the two indicators of the enterprise are twice the average of the national manufacturing enterprise, then the enterprise is classified as a high-tech enterprise. The United States adopts the above classification method, and Japan will also examine the market share of enterprises, industry influence, social responsibility and other factors. Based on the definition of China's scientific and technological private enterprises in developed countries, the basic characteristics of scientific and technological enterprises include high talent intensity, high research and experimental development investment, and wide scope of influence.

The classification standards of China's science and technology enterprises are mainly based on the "National Measures for the Administration of the Identification of China's Science and Technology Private Enterprises" issued by government departments, and refer to the definitions of science and technology enterprises in other countries. The classification criteria include: whether R&D expenditure is higher than 3% of sales, whether R&D personnel account for more than 10% of the total number of employees, whether employees with university degrees or above account for more than 30% of the total number of employees, and whether they have independent intellectual property rights (Zhao, 2022).

2.1.3 The definition of scientific and technological private enterprises

To sum up, combining the definition of private enterprises with the definition of science and technology enterprises organically, and referring to China's basic national conditions in the new era, the basic definition of science and technology private enterprises can be obtained. The scientific and technological private enterprises mentioned in this article refer to the private enterprises founded by scientific and technological personnel as the main body, which are mainly engaged in the research and development, production and sales of scientific and technological products and services. Scientific and technological private enterprises are knowledge-intensive economic entities, and their main management goal is to commercialize scientific and technological achievements with market orientation. In terms of strategy, self-development and voluntary combination should be implemented; in terms of management, self-restraint and self-management should be implemented; in terms of finance, self-financing and self-responsibility for profits and losses should be implemented (Ding & Zhou, 2022).

2.1.4 Characteristics of sci-tech private enterprises

According to the definition principle of science and technology private enterprises, the essential characteristics of science and technology private enterprises need to be as follows:

1. In the organization, the proportion of scientific and technological personnel is high. Have a strong scientific and technological product research and development ability of a certain discipline or profession, generally at the advanced level of the same industry or have their own characteristics (Gan, 2023).

2. In operation, not only has considerable high-tech product production and development capabilities, but also has strong market development and management capabilities; Adopting scientific methods to expand the market (Peng, 2023).

3. Financially independent financial and independent accounting, can use their

own funds and property to independently engage in civil activities, bear civil liability, with legal personality. Or although they do not have completely independent property control rights, they can engage in agreed civil activities under certain conditions, and independently bear civil liabilities with their relatively independent economic accounting capabilities (Wang & Li, 2020).

2.2 Porter's competition theory

In his classic book *Competitive Strategy*, Michael Porter proposed a model of industry structure analysis, namely the "five forces model" mentioned above, which holds that the existing competition situation of the industry, the bargaining power of suppliers, the bargaining power of customers, the threat of alternative products or services, and the threat of new entrants determine the profitability of an enterprise. The core of business strategy should be to choose the right industry and the most attractive competitive position in the industry.

According to the theory of "five forces Model", the overall analysis of the industrial structure of Beijing Timelot Technology Co., Ltd. can comprehensively understand the competitive factors that the enterprise may face in the industry or the industry it will enter, the actions that competitors may take and how to formulate the best offensive and counter-offensive plans. How will the industry evolve and in the long-term competition, how will enterprises rationally choose and adopt competitive strategies in order to make enterprises in the best competitive position and achieve sustainable development?

2.2.1 Threat of new entrants

The new threat in Porter's theory mainly refers to the threat posed by "new entrants". That is, in the process of economic development of the industry, the excess trend of industrial profits gradually attracts external enterprises to continue to join or penetrate into the industry. In turn, the economic phenomenon of increasing the labor and output of goods or services of enterprises, resulting in a continuous downward trend in commodity prices. In addition, new enterprises continue to seize the market share owned by the "original enterprises", which poses a huge threat to enterprises. Specifically, the threat brought by new enterprises is mainly formed in the mature stage of industrial development, and the financial phenomenon formed by excessive profits. It is a common problem faced by China and even the world industry, which is difficult to avoid and difficult to eliminate, "original enterprises" only in the rapid development of the industry and the trend of excessive profits, timely enhance their core competitiveness, in order to effectively maintain their own survival and development status, to ensure their own sustainable development.

As a system integrator, the service provided by Beijing Timelot Technology Co., Ltd. is mainly dependent on the technical support of product suppliers, and the competition of existing system integrators in its industry is increasingly stimulating. In addition to system integrators, there are other IT solution providers that may enter the same market. These solution providers may focus on a specific technology area or industry to provide targeted solutions to their customers. Their competitiveness depends on their expertise, innovation and service level.

2.2.2 Industry Competition

At this stage, many enterprises and industries in China have entered a mature stage. In addition to monopoly enterprises, most enterprises are in the state of seizing market share with similar enterprises. Therefore, the position of modern enterprises in the market competition can effectively affect the profitability of enterprises and their own development. In short, in the case of comprehensive internal resource allocation, production costs and profits, modern enterprises conduct a comprehensive analysis and research on the external competitive environment, clarify the hierarchical relationship between the existing competitive ability of enterprises and other enterprises, so as to determine the position of enterprises in the development of the industry, and gradually form a competitive means in line with their own development characteristics and concepts.

As a system integrator, Beijing Timelot Technology Co., Ltd. is in an industry that faces threats from some new entrants. These new entrants may be emerging technology companies, large IT service providers or vertical specialists. Emerging technology companies enter the system integration market, using innovative technologies and solutions to provide competitive products and services, large IT service providers may enter the system integration market by expanding their service scope, and once the experts in the vertical field enter, it can be said to be a dimensional reduction blow.

2.2.3 Threat of substitutes

Substitutability between services and commodities is the earliest consensus of modern economics research. That is, the stronger the degree of substitution of goods or services of the original enterprise, the more difficult it is to achieve the increase of market share through the differentiation of goods in the industry competition. Especially in the context of the serious homogenization of goods or services in modern enterprises, there are obvious similarities in the content, functions and cultural characteristics of goods among different enterprises, and consumers' choice of goods or services is getting smaller and smaller, which makes it difficult for enterprises to form competitiveness with goods or services as the core.

As a system integrator, Beijing Timelot Technology Co., Ltd. is not fungible. Some owners may choose to find their own product manufacturers, customized solutions according to their own needs, rather than relying on integrators, the threat of such alternatives may come from the enterprise has enough technology and resources. The development of some emerging technologies and platforms may gradually replace integrators. For example, new technologies and platforms such as low code/no code development platforms, artificial intelligence and machine learning platforms can provide faster, more efficient and automated solutions.

2.2.4 Bargaining power of suppliers

The production process of commodities needs many factors of production as support, but the value factors among the factors are the key factors that directly restrict the production cost of enterprises, and also the decisive factors that check the competitive position of enterprises in the market. Therefore, the price factors of commodity production mainly depend on the hierarchical status and bargaining power

of commodity supply and demand sides. The bargaining power of suppliers can effectively affect the transaction price of production factors. If modern enterprises are at a disadvantage in the process of bargaining with suppliers, or suppliers occupy the absolute position of supply and demand, the production cost of enterprises will rise significantly, and then affect the position of enterprises in the market competition.

The main product suppliers of Beijing Timelot Technology Co., Ltd. are Huawei, Hangzhou Hikvision and Zhejiang Dahua. These suppliers are all enterprises with a large share of the product market and a good brand reputation, and these suppliers have professional knowledge and technical advantages in their field, can provide unique products or services, they can demand more favorable prices and payment terms based on their professional knowledge and technical advantages.

2.2.5 Bargaining power of buyers

In the process of commodity trading, the bargaining power of buyers is an important factor that affects the income of enterprises. Compared with the supplier's bargaining power, although the buyer's bargaining power cannot directly affect the production cost of the enterprise, it has a significant impact on the overall income and competitiveness of the enterprise. In other words, if an enterprise holds a positive attitude towards the buyer's bargaining proposal during the transaction process, its sales volume will be significantly higher than that of similar enterprises, thus presenting an asymmetric competitive relationship and putting other enterprises that maintain the original price of goods or services at a disadvantage. However, in order to effectively improve the profits of enterprises, enterprises must be fully strategic thinking at the level of sales and prices, otherwise it will seriously affect the future development of enterprises.

As a system integrator, Beijing Timelot Technology Co., LTD., the main buyers of its products and services are some large state-owned enterprises and institutions, such as China Construction Eighth Engineering Bureau Co., LTD. The buyer's demand is large and stable, so it has strong bargaining power. In addition, when these large state-owned enterprises and institutions choose suppliers, most of them adopt the way of bidding. Usually, they will publish the information of the products or services to be purchased on some websites to attract more suppliers to participate in price competition, which virtually united other suppliers to participate in price negotiation.

2.3 Enterprise life cycle theory and characteristics

2.3.1 Relevant theories of enterprise life cycle

Enterprise life cycle refers to the whole process of an enterprise from its establishment to development, stability, decline and demise, and its origin can be traced back to the 1950s. Stanford Sachs (1957), an American economist, demographer and sociologist, put forward the initial conception of the firm life cycle theory in his article "Comparison of the Development of Firms and Populations". He believes that the development process of enterprises can be compared to the development process of humans and animals, that is, from birth, growth to maturity, decline, and finally death. This process can be divided into several stages:

1. Entrepreneurial stage: At the beginning of the establishment of a company, the founder is usually a person or a small group of people, the goal is relatively clear, the scale is relatively small, and there are not many competitors.

2. Growth stage: The company opens up the situation in the market, begins to grow rapidly, the number of employees continues to expand, and the product line continues to enrich. At this stage, companies need to constantly invest more money to expand their business.

3. Mature stage: the company has occupied a certain share of the market, the product line is relatively stable, and the growth rate is slow. Companies are beginning to try new market positioning, or looking for mergers and acquisitions to continue to expand their business.

4. Recession stage: With market saturation and increasingly fierce competition, enterprises begin to experience problems such as declining performance and shrinking market share. At this stage, companies need to face challenges and assess whether restructuring, layoffs and other measures are needed.

5. Termination stage: The enterprise has been unable to reverse the situation and has to close or carry out bankruptcy liquidation and other processing methods.

2.3.2 Characteristics analysis of enterprise life cycle

1. Start-up period

By virtue of the unique blood relationship, similar blood relationship, kinship relationship and related social network resources among private members, the cheap human capital of private members is effectively utilized to complete the early capital accumulation with low supervision cost and low financing cost, and the average annual growth rate of enterprise value is as high as 50% (Huang & Song, 2023).

(1) Property rights characteristics: the scale of enterprise capital is small, the limited resources are relatively concentrated, the business and management content is relatively simple, and the ownership is highly concentrated in the hands of business owners. Due to the highly centralized nature of ownership, control is in the hands of the individual owner.

(2) Human capital structure and enterprise performance: Private enterprises are mainly dominated by innovative professionals with entrepreneurial spirit within the private sector, while related private personnel based on blood and kinship undertake other related management and technical tasks.

(3) Compensation mechanism: For the survival and development of the enterprise, enterprise members can continuously contribute their own value without compensation, and most of the profits of the enterprise are converted into reinvestment.

(4) Corporate culture: Corporate members have the same or similar blood relationship and accept that there is a natural trust relationship between them. Consistent overall private interests make the enterprise contain spiritual forces beyond material relations, and make all members have natural sensitivity to changes in the external environment. Moreover, the low cost of psychological contract and the prevailing altruism of benefit sharing and risk sharing create strong cohesion, vitality and vitality of private enterprises

2. Growth period

When private enterprises have passed the unstable start-up period, they have entered the growth period of rapid expansion.

(1) Ownership structure: the ownership and control of enterprises are still firmly in the hands of the owners. Private enterprises are gradually structuring management structures, such as adding personnel departments, more detailed division of marketing departments and production, technology and other departments. However, the daily production rights of enterprises are only shared with private members as middle and senior managers. At this time, the private advantage of private enterprises still enables enterprises to have internal transaction cost advantages that non-private enterprises cannot have.

(2) Human capital structure and performance: In order to adapt to the continuous expansion of enterprise scale and the enhancement of management complexity, external professional managers, technicians and other human capital began to be introduced. In the growth stage of private enterprises, with the procedure and standardization of business affairs, the learning experience of private members makes the performance of enterprises grow steadily. Small-scale introduction of external professional managers and technical personnel, for the standardized operation and management of enterprises and the use of technical knowledge, building blocks.

(3) Compensation mechanism: With the increasing scale of enterprises, product sales and corporate profits have increased rapidly. In addition to a part of retained profits as the self-accumulation of enterprise development, most of the profits return to the enterprise members. At this time, there is no standardized text of the salary system, and the formulation of salary can only rely on the wise decision of the business owner. Although the human resources department has been established, the human resources assessment is generally organized by the office clerk every year, and the evaluation is mostly based on attendance, and the entire company seriously lacks the incentive mechanism linked to the performance of departments and employees.

(4) Corporate culture: The grassroots culture of private enterprises is still dominant, without the slightest wavering. Most foreign employees are excluded from the mainstream culture of enterprises, cannot be trusted, and lack corresponding attention (Zhao & Zhou, 2021).

3. Maturity period

With the further growth of private enterprises and entering the mature stage of its life cycle, the scale of enterprises has reached an unprecedented degree, but at the same time, the market is gradually saturated and the competition is increasingly fierce.

(1) Property right structure: Due to the further expansion of the scale of enterprises, increasingly fierce market competition, more complex management, and the urgent need for the application of science and technology, the limited resources within the private sector, the low management ability of families or private members, and the increasing internal transaction costs, the private sector has to further open its control over enterprises to the human capital of the society. Implement professional and standardized management. Ownership and control have a greater degree of

separation than the first two stages, and the enterprise governance structure has been preliminarily established.

(2) human capital structure and corporate performance: The realistic requirements of enterprises to break through development barriers and improve modern corporate governance structure will force business owners to delegate power. Business owners will promise to bring in a large number of professional managers and senior technical personnel with high salaries, considerable authority and residual claims.

(3) Compensation mechanism: a compensation system with incentive mechanism has been initially established, performance appraisal has been fully implemented, and material incentives for foreign human capital have been emphasized. Facing multinational companies and their industry average above the same position. However, departments generally set up deputy managers, and the main job is left to the private sector is very large, and the material salary of external professional managers as deputy positions is often difficult to make up for their efforts, not to mention the non-material welfare benefits and spiritual compensation, and the responsibility and rights are seriously unbalanced.

(4) Corporate culture: With the introduction of a large number of foreign personnel and the unremitting efforts of retained foreign personnel during the growth period, the grassroots culture of private enterprises has been impacted to a certain extent. However, such bottom-up impulse of corporate culture restructuring tends to end within human resources, surrounded by the traditional Chinese Confucian concept of moderation and compromise, and gradually eroded the grassroots culture of enterprises (Zhao & Zhou, 2021).

4.The period of decline

The maturity period is usually not very long. The enterprise first falls into the development dilemma of non-crisis without growth. If it cannot get rid of the dilemma, its competitors will eat into the market, its profits and sales will go to the bottom, its financial situation will deteriorate, the staff turnover rate will increase, and it has to face the risk of intergenerational handover of enterprise inheritance. At this time, the strategy adopted by the enterprise is mostly to strive for profit, and turn its micro. The scale of enterprises is shrinking. The increment speed of enterprise value shows a decreasing trend.

(1) Property rights system: When various conditions of market competition require private enterprises to break through their own boundaries, need to effectively integrate social financial capital with private capital, need to share enterprise asset ownership, residual claim and operation control with non-private members, or even need to give up private control, most private business owners cannot keep pace with the times. It still operates in a closed circle of private financial capital and human capital, and is still attached to the absolute control of ownership and control of private enterprises.

(2) Human capital composition and corporate performance: foreign human capital is still excluded from the enterprise, the reform of compensation mechanism and corporate culture is difficult to sustain, the value of human capital is not respected

accordingly, and a large number of excellent foreign human resources are lost.

(3) Compensation mechanism: When enterprises enter the recession period, the market demand declines, the industry prospects are unclear, enterprises often need to cut expenses to maintain survival, so the salary level will decline accordingly, and even layoffs and other austerity measures.

(4) Corporate culture: With the continuous decline of corporate profits, many welfare activities related to corporate culture are gradually cancelled, and enterprises gradually lose the cohesion and centripetal force for employees (Zhao & Zhou, 2021).

Private enterprises also have to face handover risks during this period. The lack of a corresponding handover system will often make private members antagonize, weaken and split the enterprise, and reduce the competitiveness of the enterprise.

2.4 Definition and connotation of sustainable development

2.4.1 Definition of sustainable development

With the end of World War II, the third Industrial Revolution began in the second half of the 20th century. Various cutting-edge technologies, including biology, aerospace, and artificial intelligence, continue to emerge, and mankind has entered the era of science and technology. At first, people thought that as long as we followed the existing development pattern, mankind would make more and more progress and the world would become better and better. However, with the emergence of crises such as resource depletion, land loss, and environmental pollution, people gradually realize that the traditional development model of industrial civilization is not sustainable, and people urgently need a sustainable development model (Zhuang, 2019).

In 1980, the concept of sustainable development was first proposed by the International Union for Conservation of Nature. "The fundamental relationships between nature, society, ecology, economics and the use of natural resources must be studied to ensure global sustainable development," it says in its World Programme for the Conservation of Natural Resources.

The American environmentalist Lester Brown(1981) advocated in his book *Building a Sustainable Society* that sustainable development should be promoted by protecting the resource base, controlling population growth, and developing renewable energy.

The World Commission on Environment and Development systematically elaborated the idea of sustainable development. In its report, *Our Common Future*, sustainable development is defined as "development that meets the needs of the present without jeopardizing the ability of future generations to meet their own needs."

The Chinese government has also paid enough attention to sustainable development. In the *White Paper on Population, Resources, Environment and Development in the 21st Century*, China's long-term social and economic development plan includes a sustainable development strategy for the first time. To sum up, the most striking feature of sustainable development is that development at the present stage should not be at the expense of the interests of future development. It is necessary to formulate a reasonable development strategy to achieve the effect of

both present and future development. In addition, sustainable development also includes a concept of development that can maintain the trend of sustainable development despite the unpredictable and changing environment.

2.4.2 Connotation of sustainable development of enterprises

Some foreign scholars have made some exploration on the sustainable development of enterprises. Enterprises continue to inject vitality into themselves, look for growth points, and always maintain the leading edge of competition, so as to achieve the long-term goal of enduring, called the sustainable development of enterprises. Adhere to adapt to the changing environment, in order to continuously expand market share and profits, effective allocation of limited internal resources on the basis of continuous improvement of profitability, and expand the scale of the enterprise. From the perspective of sustainable economy, it is believed that the connotation of sustainable development of enterprises is "the ability of enterprises to fully meet the expected return of investment made by investors for their development, maintain sustainable competitiveness and create sufficient added value" (Deng, 2021).

In recent years, Chinese scholars have different perspectives and emphases on the study of sustainable development of enterprises. The research direction of some scholars lies in the "sustainable growth of enterprises", which has the same meaning and purpose as the "sustainable development of enterprises" studied in this paper. The survival of the enterprise does not represent the development of the enterprise, such as some century-old stores, in the new period and cannot keep up with the pace of the times, update and upgrade their products, and even slowly decline, such enterprises are actually sustained without development. In addition, some enterprises have developed rapidly after their establishment and gained their own popularity in the market within a few years, but soon disappeared due to corporate strategic mistakes or changes in the external environment. This kind of enterprises with high opening and low moving have developed but not sustained (Li, 2022).

It can be seen that the sustainable development of enterprises should be the development process of enterprises to survive in the market competition, and from small to large, from weak to strong, in this process, the growth of enterprises and sustainable management should be reflected at the same time. The development of an enterprise is an interactive process of expanding its scale and changing its structure. Usually, most enterprises go through a process from establishment and growth to maturity and decline. Sustainable development is to successfully survive the growth period, extend the maturity period of the enterprise, and create more value in this period as much as possible. In order to achieve cross-cycle progress before the onset of the recession (Wu, 2003).

Based on the above theories, this study defines the sustainable development of enterprises as that in the process of pursuing long-term prosperity, enterprises should not only consider increasing short-term profits and expanding market scale, but also consider maintaining long-term sustained growth in business performance and establishing and maintaining good public relations with social and economic development, so as to continuously realize the life growth process of mutual change and spiral of enterprise quality.

2.4.3 Influencing factors of enterprise sustainable development

The key factors affecting the development of Chinese enterprises include: the influence of corporate reputation and product brand, the level of enterprise team, the utilization rate of infrastructure, the financial management ability of enterprises, the market structure, the customer relationship management ability, the organizational structure and strategic matching of enterprises, the capital operation ability, and the innovation ability of enterprise technology and management (Liu, 2021).

This paper analyzes the factors affecting the sustainable development of enterprises from four aspects: business philosophy, culture, objective conditions of enterprises and management system of enterprises, and points out that the government's macro-control and other aspects of society are the factors affecting the sustainable development of enterprises (Guo, 2005).

From the perspective of social environment, the social environmental factors that affect the sustainable development of science and technology enterprises mainly include: the country, the region and the society, and the influence of which is mainly analyzed in the following aspects: human environment, national economic development level, market environment, policy and legal environment, social security environment and supporting service environment. (Zhang & Liu, 2021).

If an enterprise wants sustainable development, its core lies in continuous innovation, from the relationship between economic development and corporate sustainable development, the relationship between corporate sustainable development and corporate life cycle, the relationship between corporate sustainable development and corporate goals, strategies and effective allocation of resources, the relationship between corporate sustainable development and scientific development, and the relationship between corporate sustainable development and scientific development. The relationship between enterprise sustainable development and management and innovation is analyzed and studied in five aspects to improve the flexibility and controllability of enterprises (Xu, Zhang & Chen, 2021).

Starting from the five aspects of core competitiveness, the unity of innovation and control, the unity of enterprise and environment, the new leading business areas, and brand strategy, and from these five aspects, the factors affecting the sustainable development of enterprises are analyzed and corresponding countermeasures are proposed (Xu, 2022).

Due to the different research directions and environment, scholars have different understandings about the factors affecting the sustainable development of enterprises. However, to classify different problems, there are mainly the following aspects: (1) the core competitiveness of enterprises. Core competitiveness is difficult for competitors to imitate, one of the most basic conditions for enterprise development, can realize the most concerned customers, core and fundamental interests; (2) The influence of human capital. Manpower is the foundation of enterprise development, and it promotes the growth of enterprises, the creation of wealth and the progress of society. In order to realize the sustainable development of enterprises, the comprehensive quality of personnel must be improved. Only when the technical personnel of enterprises master more core technologies can they promote the

sustainable development of enterprises. (3) Maintain consistent market demand. Market demand refers to a certain customer in a certain time, a certain region, a certain market environment, willing to buy a certain product and willing to enjoy a certain service. Therefore, in most cases, the combination of consumer demand is regarded as the actual demand of the market. If an enterprise wants to establish itself in the industry and strive to meet the needs of consumers is the first prerequisite, that is, it must be consistent with the market and understand the development needs of the market in real time. Only by being consistent with the market can an enterprise have a stable market share and continuous earnings; (4) Innovation ability. The only way out for enterprises that continue to grow steadily is to develop their own innovation ability, which is also the fundamental driving force for the success and survival of enterprises. In today's increasingly fierce market competition, the rapid development of technology, the shortening of product life cycle, the acceleration of update speed, do not want to be eliminated by the market, enterprises only through continuous innovation to achieve. Enterprise innovation includes product innovation, enterprise system innovation, organization innovation, technology innovation, etc. (5) In addition to the above four factors, the business system, business philosophy and corporate culture of enterprises also have a great impact on the sustainable development of enterprises.

3. Research Methodology

The research method of this paper is documentary method. On the basis of a large number of literature reading and research, classification and analysis of relevant data, understanding of domestic and foreign research status and previous research results, timely grasp the latest research trends at home and abroad. Pay attention to current affairs, and understand the innovation experience and problems encountered by domestic scientific and technological private enterprises. Based on the literature review on the sustainable development of science-based private enterprises, this paper summarizes the current situation of the development of science-based private enterprises, finds out the problems in the sustainable development of science-based private enterprises, and puts forward countermeasures to solve the dilemma of science-based private enterprises in the light of the actual situation of science-based private enterprises.

According to the theory of the "Five forces model", the overall analysis of the industrial structure of Beijing Timelait Technology Co., Ltd. can comprehensively understand the competitive factors that the enterprise may face in the industry or the industry it will enter, the actions that competitors may take and the best offensive and counteroffensive plans, the evolution of the industry and the long-term competition. Enterprises will choose and adopt competitive strategies rationally in order to make enterprises in the best competitive position and achieve sustainable development.

As a system integrator, Beijing Timelait Technology Co., Ltd. must first face industry competition, in addition to the original industry system integrators, there are other IT solution providers may enter the same market. These solution providers may

focus on a specific technology area or industry to provide targeted solutions to their customers. Their competitiveness depends on their expertise, innovation and service level.

Second, the industry faces threats from new entrants. These new entrants may be emerging technology companies, large IT service providers or vertical specialists. Emerging technology companies enter the system integration market, using innovative technologies and solutions to provide competitive products and services, large IT service providers may enter the system integration market by expanding their service scope, and once the experts in the vertical field enter, it can be said to be a dimensional reduction blow.

Of course, the threat of substitutes cannot be underestimated, itself Beijing Timelait Technology Co., Ltd. products and services are poor, once the owner may choose to find their own product manufacturers, customized solutions according to their own needs, rather than relying on integrators, the company can be said to be a fatal blow. The suppliers of Beijing Timelait Technology Co., Ltd. are enterprises with a large share in the product market and a good brand reputation, and these suppliers have professional knowledge and technical advantages in their field, while the main buyers of products and services are some large state-owned enterprises and institutions, both of which have strong bargaining power.

4. Finding and Conclusion

According to Porter's competitive theory, the overall analysis of the industrial structure of Beijing Timelait Technology Co., Ltd. can give a more comprehensive understanding of the competitive factors that the enterprise may face in the industry or the industry it will enter, the actions that competitors may take and how to formulate the best offensive and counteroffensive plans, how the industry will evolve and how to compete in the long run. How to choose and adopt competitive strategy rationally in order to make enterprises in the best competitive position and achieve sustainable development.

4.1 Finding

4.1.1 Funding and financing difficulties

Since its establishment in 2007, Beijing Timelait Technology Co., Ltd. has only obtained 2 strategic financing deals in 2019 and 2020, totaling more than 23.6 million yuan, according to Tianyan Research. Compared with state-owned enterprises or multinational companies, private enterprises may face greater challenges in financing. Due to the lack of stable funding sources and credit security, it is more difficult for enterprises to obtain financing support, which limits their ability to sustainable development.

4.1.2 Market competition is becoming increasingly fierce

Beijing Timelait Technology Co., Ltd. is a system integration enterprise with the integration of Internet of Things, big data and artificial intelligence as the core technology, providing customers with system integration services and a small number of products. According to the data of Tianyan, as a system integration service

provider, its irreplaceability is weak. According to statistics, by the end of 2021, there are 4,439 intelligent building engineering first-class qualification enterprises in China (Yan, 2021), and by September 2022, the number has increased to 6,510 (Lao, 2022). These enterprises provide the same services as Beijing Timelot Technology Co., LTD., and the market competition is becoming increasingly fierce.

The suppliers of Beijing Timelot Technology Co., Ltd. are enterprises with a large share in the product market and a good brand reputation, and these suppliers have professional knowledge and technical advantages in their field, can provide unique products or services, they can demand more favorable prices and payment terms based on their professional knowledge and technical advantages.

The enterprises that purchase the products and services of Beijing Timelot Technology Co., Ltd. are mainly state-owned enterprises or public institutions. These enterprises have large and stable demand, and usually have greater bargaining power in the current situation of fierce competition in the industry and ample market supply, and these enterprises can use market competition to negotiate more favorable prices and conditions.

4.1.3 The independent innovation ability of enterprises is weak, and R&D input and scientific research output are insufficient

Beijing Timelot Technology Co., Ltd. as a private enterprise of science and technology, its independent innovation ability is weak, R&D input and scientific research output are insufficient. As can be seen from the financial data released by the company, in the 2022 annual financial statement, its research and development investment only accounts for 3.25% of its total revenue, which can only be said to have just reached the standard as a technology enterprise. Research and development and independent innovation are the basis for the industrial development of scientific and technological private enterprises. At present, the overall quality of scientific and technological talents in scientific and technological private enterprises is low, especially the lack of top talents with international influence, and the quantity and quality of invention patents of enterprises and individuals are not satisfactory.

4.2 Conclusion

With the increasingly fierce market competition, the living environment of sci-tech private enterprises tends to deteriorate gradually, which is generally reflected as follows: first, the difficulty of financing is increasing; Second, the market competition is becoming increasingly fierce; Third, the independent innovation ability of enterprises is weak, and the products and services are irreplaceable. Fourth, there is no good corporate culture; Fifth, the buyer has strong bargaining power, and sixth, the supplier has strong bargaining power. These factors lead to smaller profit margins. One of the most important factors is the poor irreplaceability of products and services. The solution is to strengthen the independent innovation ability of enterprises and enhance the irreplaceability of products and services. Once the products or services provided by enterprises are irreplaceable, enterprises will sustainably engage in production and business activities. At the same time, optimize supply chain management, reduce dependence on a single supplier, and enhance bargaining power.

All these are effective means to improve the competitiveness of enterprises in the highly competitive market. At the same time, it is necessary to strive to improve the financing ability of enterprises, adhere to the flexible product strategy and product innovation according to the market-oriented, improve the quality of their products and services, and cultivate the core competitiveness of their products. Finally, in order to maintain the market competitiveness, Enterprises still need to strengthen their own development potential, improve product competitiveness, enhance corporate credit and other means to give investors enough confidence.

5. Recommendation

On the basis of consulting and reading a large number of relevant literature, this paper makes an in-depth analysis and research on the factors affecting the sustainable growth of China's sci-tech private enterprises in different life stages, and obtains some useful results and conclusions. This paper puts forward some suggestions on the sustainable development of sci-tech private enterprises from both internal and external perspectives.

1. To improve the enterprise's own financing ability

Strive to improve the financing ability of enterprises themselves. Under the current economic situation, China has shown a clear policy preference for enterprise entrepreneurship and innovation, the capital market is extremely active, and the financing environment for enterprises is relatively improved. However, enterprises still need to strengthen their own development potential, improve product competitiveness, enhance corporate credit and other means to give investors enough confidence, through the means of financing for the development and expansion of enterprises to provide necessary financial support.

2. Enterprises need continuous innovation to develop sustainably

Only innovation can make enterprises have mutations and have strong adaptability to cope with the rapidly changing market. Enterprises must adapt to the new market and new business environment in the Internet era, and must transform and develop without innovation. A notable feature of a market economy is that producers constantly innovate. This is not only for profit purposes, but also to be able to survive and secure a place in the market. If they fail to innovate, they will cede market share to new entrants. The flood of new businesses into the market leads to boom-and-bust cycles characterized by erosion of corporate profit margins and reduced survival rates.

3. To cultivate the core competitiveness of their products

No matter how fast the external environment changes, it is still necessary to improve the product and improve the quality of service. Product and market factors are the most critical factors that affect the sustainable development of sci-tech private enterprises. If private enterprises of science and technology want to stand firm in the industry in the new era and new situation, and develop and grow, they must put products and markets in the first place. According to the market-oriented, adhere to flexible product strategy, adhere to product innovation, improve the quality of their products and services, and cultivate the core competitiveness of their products.

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