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Analysis on risk prevention, control and optimization strategy of cash flow management in scientific and technological innovation enterprises

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Abstract: *This paper focuses on the key field of cash flow management of scientific and technological innovation enterprises, deeply analyzes its characteristics, insight into potential risks, and puts forward targeted risk prevention and control and optimization strategies. Through the research on the unique characteristics of cash flow of scientific and technological innovation enterprises, the cash flow challenges faced by them at different stages of development are clarified. A detailed analysis of various risks, such as financing risk, investment risk and operational risk, aims to provide a comprehensive and practical guidance on cash flow management for science and innovation enterprises, and help them improve their financial stability and sustainable development ability.*

Keywords: *Science and technology innovation enterprises; Cash flow management; Risk prevention and control; Optimization strategy*

1. Introduction

As an important force to promote scientific and technological innovation and economic development, science and innovation enterprises occupy a key position in the national innovation driven development strategy. However, due to its unique development mode and business characteristics, science and innovation enterprises face many complex problems in cash flow management. Cash flow is like the "blood" of an enterprise, and its health is directly related to the survival and development of an enterprise. Effective cash flow management can not only ensure the daily operation of enterprises, but also provide solid financial support for the innovation activities of enterprises. Therefore, it is of great practical significance to study the risk prevention, control and optimization strategy of cash flow management in scientific and technological innovation enterprises[1].

2. Analysis on the characteristics of cash flow management of scientific and technological innovation enterprises

2.1 Mismatch between R&D cycle and revenue realization

In the early stage of development, R&D activities tend to occupy the core position, and the length of R&D cycle directly affects the rhythm of cash inflow. Taking biomedical enterprises as an example, new drug research and development is a long and uncertain process. As show in table 1.

Table 1: Case data of science and technology innovation enterprises

Enterprise type	R&D features	Related data
Biopharmaceutical Enterprises	The R&D cycle is long, the uncertainty is large, the capital investment is huge, and all links require a large amount of funds. During the R&D period, the product sales revenue is small, and the net outflow of funds continues.	1. Average R&D costs: up to billions of dollars 2 R&D cycle: generally 10 to 15 years 3 The enterprise has invested more than 3 billion yuan in R&D funds for 10 consecutive years, and the drugs have been approved for listing in the 12th year
Chip R&D Enterprises	A large amount of funds need to be continuously invested in technology research and development to catch up with the technological frontier, cash outflow rigidity	1. Proportion of annual R&D investment in operating income: 30% - 40% 2 Total R&D investment in the past five years: more than 10 billion yuan Tape out cost: up to tens of millions of yuan each time

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From the discovery of drug targets, the screening of leading compounds, to preclinical research, clinical trials, to drug approval and marketing, all links require huge capital investment, and take years or even decades. According to statistics, the average cost of research and development of an innovative drug is as high as billions of dollars, and the research and development cycle is generally 10 to 15 years. During this period, enterprises had almost no product sales revenue, and the net outflow of funds continued. For example, a well-known biomedical enterprise has invested more than 3 billion yuan in research and development for 10 consecutive years in the research and development of a new anticancer drug, and the drug was not approved for listing until the 12th year. Previously, the enterprise could only rely on a small amount of government subsidies and venture capital to maintain its operation, and its cash flow was extremely unstable, facing huge financial pressure[2].

This mismatch between R&D investment and income makes science and technology enterprises in the stage of "burning money" for a long time, which puts forward extremely high requirements for capital reserves and financing capabilities of enterprises. Once the follow-up funds can not keep up, R&D projects will be forced to interrupt, early investment will be wasted, and enterprises may even fall into a desperate situation.

2.2 Sustained high R&D investment

In order to stand out in the fierce market competition, science and technology enterprises must continue to invest a lot of money in technology research and development. Taking chip R&D enterprises as an example, semiconductor technology is changing with each passing day. In order to catch up with the technological frontier, enterprises need to constantly invest huge amounts of money in the research and development of new processes and new structures. From basic research, chip design, to tape out, packaging and testing, each link requires top talents, advanced equipment and a large number of test consumables.

In order to break through the bottleneck of high-end chip manufacturing, a well-known chip design company invests R&D funds accounting for 30% - 40% of its business income every year. In the past five years, the total investment in R&D has exceeded 10 billion yuan, a R&D team composed of hundreds of Ph.D. and master's degrees has been established, and billions of yuan worth of electronic design automation (EDA) software and high-end testing equipment have been purchased. In the process of R&D, the cost of each tape out is as high as tens of millions of yuan, and it often takes many attempts to succeed. This sustained high R&D investment makes the cash outflow of enterprises rigid, and it is difficult to reduce R&D expenditure even when the market environment is poor and revenue fluctuates, otherwise it will face the risk of backward technology and being eliminated by the market[3].

3. Deep insight into cash flow management risks

3.1 Risk of capital fracture

3.1.1 Hidden dangers of excessive dependence on external financing

In the development process of science and technology enterprises, excessive dependence on external financing is like sailing on a single fragile sail in a turbulent sea, facing the risk of collapse at any time[4]. Taking start-ups in the field of new energy vehicles as an example, such enterprises are in the dual stage of technology research and development and market development. At the research and development level, huge funds need to be invested in core areas such as battery technology innovation and autopilot system research and development to improve product performance and enhance market competitiveness; On the market side, we should spend a lot of money on brand building, sales channel laying and after-sales service network construction to seize market share. However, most new energy start-ups have not yet formed their own profitability, and the accumulation of internal funds is meager, so they can only place their hopes on external financing.

When the capital market environment is loose, venture capital, private equity investment and other funds pour in, and enterprises can easily obtain financing by virtue of innovative technological concepts and broad market prospects. However, once the capital market is cold and enters the "cold winter" period, investors'risk preference drops sharply, and the difficulty of financing rises sharply. Geely promised that the financing was not in place, and Baidu decided not to renew the investment due to financial risks after due diligence. Previously, these enterprises relied too much on equity financing. When external funds were cut off, they lacked stable profitability, the capital chain was on the verge of

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breaking, the operation of enterprises was at an impasse, and a series of problems such as R&D stagnation, production interruption and employee turnover came one after another, which seriously threatened the survival of enterprises[5].

3.1.2 Dilemma of insufficient internal capital reserves

Internal capital reserve is the "ballast stone" for enterprises to cope with emergencies and maintain operational stability, but many science and technology enterprises ignore this point. Taking a software start-up company as an example, in the stage of rapid development of the Internet industry, the company has won market favor with an innovative mobile application, and the number of users has increased rapidly. Encouraged by the market heat, the management of the enterprise has formulated a radical expansion strategy. On the one hand, it has expanded the technology R&D team on a large scale, recruited Algorithm Engineers, software designers and other professionals with high salaries, and strived to accelerate the iterative upgrading of products; On the other hand, we have invested heavily in marketing, rapidly improving product awareness and seizing market share through all-round online and offline advertising and in-depth cooperation with major app stores.

In this process, enterprises use a large amount of funds for business expansion, but ignore the retention of internal funds. Once the market competition intensifies, such as competitors launch similar and more advantageous products, which leads to the slowdown of the company's user growth, the decline of payment conversion rate and the sharp decline of operating income, the enterprise does not have enough emergency funds on its books to maintain daily operations. R&D investment is unsustainable, new functions can not be launched on time, further weakening product competitiveness; Marketing activities have been forced to shrink, brand exposure has been reduced, and the loss of users has accelerated, so enterprises have fallen into a vicious circle, the risk of capital chain rupture is imminent, and the development of enterprises is in jeopardy.

3.2 Risk of inefficient utilization of funds

3.2.1 Misunderstanding of blind investment expansion

In the development process of science and technology enterprises, some enterprises blindly open the road of diversified investment expansion due to the lack of accurate understanding of their core competitiveness and market positioning, and fall into the quagmire of inefficient utilization of funds. Taking black sesame as an example, as a traditional food enterprise, it is eager to cross the border new energy field when the e-commerce business has not yet established a solid foundation and formed a mature profit model. In 2017, black sesame announced its entry into new energy, increased its capital by 500 million yuan in 2022 to control Tianchen new energy, and planned to invest 3.5 billion yuan in the construction of lithium iron phosphate energy storage lithium battery production base in 2023. However, most of these projects are not progressing smoothly, such as the energy storage battery production base project, which shows no substantial investment and construction in the 2023 annual report[6].

Such blind investment behavior makes enterprise funds scattered in many unfamiliar fields like loose sand, and new investment projects are difficult to achieve profits in the short term, which not only can not bring expected returns to enterprises, but also continue to consume a large amount of funds and resources, dragging down the overall performance. According to the financial report data of black sesame, in 2023, its e-commerce business revenue declined, and investment in the field of new energy was ineffective. The company's net profit increased by 130.70% year-on-year, but its revenue decreased by 11.25% year-on-year. The trend deviated from that of blind investment expansion, reflecting the negative impact of blind investment expansion on the efficiency of capital utilization and financial situation of enterprises. The development of enterprises is in trouble, and it is urgent to adjust their strategies and return to a rational investment track.

3.2.2 Disadvantages of poor management of working capital

Working capital is like the "blood" of enterprise operation, and its management level is directly related to the survival of enterprises. Taking garment manufacturing science and technology enterprises as an example, due to the deviation of market demand forecast and the lack of forward-looking product planning, it is very easy to fall into the dilemma of inventory backlog. Once the prediction of the popular style of the season is wrong, the mass production of clothing can only be overstocked in the warehouse, occupying a huge amount of money. At the same time, in order to expand market share, the credit policy has been excessively relaxed in the sales link, the scale of accounts receivable has

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expanded sharply, and the recovery cycle has been greatly extended.

A garment science and technology innovation enterprise, due to its failure to accurately grasp the trend of fashion trends, led to the slow sales of new clothing, inventory backlog funds as high as tens of millions of yuan, inventory turnover rate is 30% lower than the average level of the same industry. At the same time, in order to cooperate with large distributors and give them a 90 day accounting period, the turnover days of accounts receivable climbed to 120 days, far exceeding the industry standard of 60 to 90 days. A large number of funds are effectively occupied, the daily operating funds of enterprises are stretched, unable to invest in key links such as new product research and development and equipment renewal in time, operating efficiency is low, profitability is seriously damaged, and even face the risk of capital chain fracture, highlighting the fatal crisis brought about by poor management of working capital[7].

4. Risk prevention and control strategy intensive research and optimization strategy

4.1 Building diversified financing channels

Taking bytedance as an example, in the early stage of enterprise development, with highly innovative algorithm technology and keen market insight, it developed explosive products such as Toutiao today, showing great market potential. At this time, the company introduced a small amount of angel investment, sold about 10% of the equity, and obtained start-up funds for technology research and development and team building to ensure that products can be rapidly optimized iteratively to meet user needs. With the exponential growth of the number of users and the steady increase of product market share, the company has entered a stage of rapid development. In the a-round financing, in the face of the favor of many well-known investment institutions, the company made a prudent choice, choosing Sequoia Capital and other institutions that fit the strategic objectives and complement resources, selling about 20% of the equity, with a financing amount of tens of millions of dollars. This fund is mainly used to expand business areas, such as the layout of short video business, building a tremolo platform, while increasing investment in algorithm research and development to improve the accuracy of personalized recommendation.

When Douyin exploded globally and became a phenomenal application, and the company's valuation soared, bytedance paid more attention to the balance between the strategic value of funds and equity dilution in follow-up financing. In the round B and round C financing, on the one hand, we should attract investment institutions with global influence, such as Softbank vision fund, to enhance the company's international visibility and resource integration capabilities; On the other hand, we should strictly control the dilution ratio of equity, transfer no more than 15% of equity each time, ensure the control of the founding team over the company, and accurately invest the amount of financing in key areas such as overseas market expansion, technological innovation and upgrading, and content ecological construction. Through this phased and precise equity financing strategy, bytedance has maintained the steady development and Strategic Autonomy of the enterprise while obtaining sufficient financial support, laying a solid foundation for building a leading global technology giant.

4.2 Strengthen internal capital management

In the commercial promotion stage of 5g technology, the market demand is changing with the progress of base station construction, the popularization speed of terminal equipment, consumer package selection preferences and other factors, and communication technology enterprises are facing huge budget management challenges. By adopting the rolling budget method, enterprises continuously update and adjust their budgets on a quarterly or monthly basis. At the end of each issue, the follow-up budget is finely revised in combination with the latest market developments, such as 5g user growth rate, traffic use trend, competitor package price adjustment, as well as the actual situation of technology research and development progress, equipment procurement plan and marketing promotion effect within the enterprise. In terms of revenue budget, according to the number of new network users, package upgrade ratio and other real-time data, accurately predict the next quarter or monthly operating income; In terms of cost budget, according to the market price fluctuation of key components such as chips and the change of base station construction and maintenance cost, various expenses are accurately controlled..

Working capital turnover efficiency is like the "blood circulation" speed of enterprises, which is directly related to the vitality and competitiveness of enterprises, especially for science and technology

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enterprises. Taking manufacturing science and technology innovation enterprises as an example, in supply chain management, actively introducing supply chain financial instruments is an effective way to solve the capital dilemma. Enterprises build close strategic cooperative relations with upstream and downstream suppliers and distributors, and realize high-quality accounts receivable in advance with the help of accounts receivable factoring business. When enterprises deliver products to core customers, they immediately transfer accounts receivable to financial institutions, quickly withdraw funds, and shorten the capital recovery cycle.

5. Conclusion

This study deeply analyzes the characteristics, risks and coping strategies of cash flow management in science and technology enterprises. The cash inflow of Kechuang enterprises is uncertain, the R&D cycle and income are mismatched, and the market competition impacts the sales repayment; Cash outflow is rigid, requires sustained high R&D investment, and faces rapid iteration of equipment and labor costs. This leads to risks such as capital fracture and inefficient utilization, excessive dependence on external financing, insufficient internal capital reserves, blind investment expansion, poor management of working capital and other problems, which seriously threaten the survival of enterprises.

In view of these difficulties, it is proposed to build diversified financing channels, rationally plan the rhythm of equity financing, and expand the channels of creditor's rights financing; Strengthen internal capital management, optimize the budget management system, and improve the efficiency of working capital turnover. All links are closely related, financing injects capital vitality into enterprises, internal management ensures precise allocation and efficient operation of funds, cooperates to ensure the health of the capital chain of science and technology enterprises, helps them move forward steadily in the wave of innovation and development, and continues to inject power into economic growth.

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