

# **RESEARCH ON THE IMPACT OF R&D INVESTMENT ON THE FINANCIAL PERFORMANCE OF THE SECURITY INDUSTRY: A CASE STUDY OF DAHUA COMPANY AND HIKVISION \***

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## **Abstract**

Under the environment of artificial intelligence upsurge and Chinese policy, enterprises should take independent innovation and implement innovation-driven development strategy. China's security industry must experience a wave of technological innovation. With the concept of artificial intelligence put forward, the security industry has quickly entered the era of intelligence. Therefore, how to maintain the corresponding intensity of R&D investment in the new era while maintaining the stable asset structure and cash flow of the enterprise. In this study, two excellent representatives of Chinese security sweat, Dahua and Hikvision, were selected to analyze the differences between R&D investment and financial performance through data. The purpose of this study is to explain the commonness between R&D investment and enterprise financial performance.

**Keywords:** Security Industry, R&D Investment, Financial Performance

## **Introduction**

With the rapid development of communication and network technology, the security industry has entered the era of intelligence how to carry out technological innovation in the environment of competitive incentive to maintain the development of enterprises. Innovation depends on R&D investment, so R&D investment is an important factor of financial performance. The investment of enterprises in R&D activities continues to increase, and the ability of technological innovation gradually improves with the development of society. From the content disclosed by various companies, the company's R&D investment is also increasing, innovation ability has become stronger than before.

So what is the impact of R&D investment on financial performance? And Dahua and Hikvision R&D investment in financial performance differences where?

## **Objectives**

The research focuses on whether R&D investment has an impact on financial performance and whether Dahua and Hikvision R&D investment have differences in financial performance. First of all, combing the literature, laying a theoretical foundation for the article research, selecting Dahua Company and Hikvision as case companies, taking R&D investment and financial data from 2013 to 2019 as research data. The impact of R&D investment on financial performance is analyzed by financial index analysis and comparative evaluation.

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## Methodology

### 1. Literature review

At the beginning of the 1920s, Schumpeter put forward the theory of technological innovation (Technical Innovation Theory). Schumpeter believes that innovation is the establishment of a new production function and a new product, which is formed by combining different elements. Schumpeter believes that a single technology or product is not a so-called innovation, but a new operating system that can help the original invention or product bring new changes, not just add new functions, that is innovation. Shao Hua's Introduction to Engineering (2015) is research and development (Research and Development, referred to as R and D or R&D). Basic research, technology development and product development constitute research and development. The significance of new product development is to meet the needs of consumers.

First of all, the theory of technological innovation shows that the rapid development of economy cannot be separated from technological innovation. Enterprise innovation is a process of updating and reforming the original production system. Finally, the theory of technological innovation emphasizes the importance of technological innovation. If the enterprise consciousness wants to occupy the market quickly, it is very important to carry out R&D activities and improve the core competitiveness in order to obtain better technological core. It is also the key factor for enterprises to improve their performance. At present, the market demand of security industry is rising rapidly and the market competition is becoming more and more fierce. The development of enterprises lies in the strength of product competitiveness to a great extent. According to the theory of technological innovation, enterprises should form innovative output through innovation and R&D activities. Improve core competitiveness and financial performance.

Through combing the literature, it can be seen that R&D investment and financial performance can promote the innovation products of enterprises. Through investment in R & D, the number of patent rights and intellectual property rights of enterprises can be improved accordingly. However, the research results of the relationship between R&D investment and financial performance are diversified, and the conclusions are positive correlation, negative correlation, insignificant correlation, and lag.

Cui Xiumei, Wang Yiming (2016) pointed out that R&D investment should be efficient in order to have a positive impact on enterprise performance. This literature selects IT enterprise Huawei and association as the research object, and compares the relationship between the R&D investment intensity of Lenovo and the return on net assets and the growth rate of sales between 2011 and 2015. It is found that when the R&D investment intensity of the research object reaches the effective level, the R&D investment and enterprise performance will have a positive impact, otherwise the impact will not be obvious, and there will be a negative impact. Because of the different emphasis on technology and trade, the performance of enterprises is different.

Wu Zhong and Zhong Suyan (2018) pointed out that there was a negative correlation between R&D investment and financial performance of listed Chinese medicine enterprises. Based on the data of 48 listed companies in Chinese A stocks from 2012 to 2016, the paper establishes a multivariate linear regression model and finds that there is a negative correlation between R&D investment and financial performance. It is difficult to bring benefits to enterprises immediately.

Anita Deng (2013) took R&D expenses as dependent variables and profits as independent variables. In the period of enterprise development, the increase of R&D expenses can improve the profit level; in the period of growth and maturity, the profit level will be reduced; in the period of development, in order to develop products, the R&D

expenses are more, but affected by tax policy.

Lu Keying (2014) pointed out that R&D investment lags behind, and the lag time is two years. This document takes the listed companies of Chinese software and information technology service industry as the research object, selects the relevant data of this kind of listed companies from 2012 to 2014 as a sample, and measures the R&D investment of enterprises by R&D the intensity of investment and personnel input. The positive effect of R&D investment on performance is two years. It shows that most R&D investment is lagging behind, but R&D investment is difficult to show results immediately.

Zhou Haoxin (2020) pointed out that HV company's R&D investment can promote growth ability and have different financial indicators. Taking the security industry HV company as the research object, the financial data of the company from 2011 to 2019 are sorted out. According to the orientation of enterprise strategy, it is helpful for enterprises to better adjust the proportion of R&D investment in enterprises, so that enterprises can maintain the intensity of R&D investment while operating normally.

Therefore, the starting point of this paper is to explain and analyze from the point of view that R&D investment is the key element to improve the innovation ability of enterprises, and try to prove that increasing R&D investment can promote innovation and improve market competitiveness.

## Research subjects

Artificial intelligence is considered to be the main technology used in the fourth Industrial Revolution and has attracted great attention from various industries. With the rapid development of artificial intelligence technology, the Chinese government recognizes the importance of artificial intelligence, and begins the layout of artificial intelligence industry. Because of the tide of artificial intelligence and the policy of the Chinese government, artificial intelligence will be applied to the field of public safety in China, making the security industry transform to the direction of intelligence. Based on the enterprise size and development prospect of security industry, Dahua Company and Hikvision are selected as the case study objects

## Results and Discussion

### 1. Impact of R&D intensity on financial performance

Combined with the intensity of R&D investment of Dahua Company, it can be seen from figure 4 that the profitability index of Dahua Company showed a downward trend from 2013 to 2016, while 2017-2019 was a fluctuating trend, but it was relatively stable. The profitability index of Dahua Company is obviously higher than the industry average, and the profitability of Dahua Company is better under the environment of poor overall benefit of the industry.

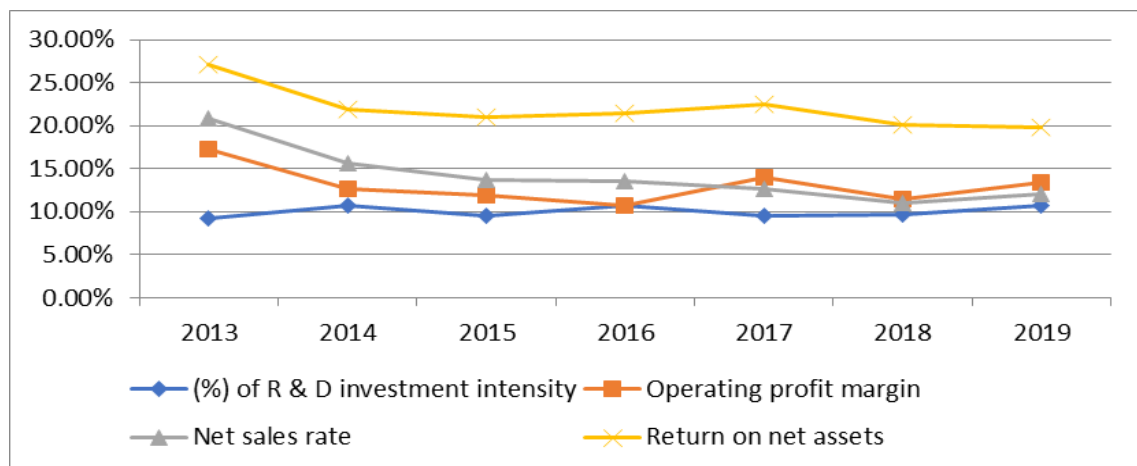


Figure 4.1 Changes in R &amp; D intensity and profitability of Dahua Company, 2013-2019

The net operating interest rate and the return on net assets are also indicators of net profit, which is the same as the operating profit rate, because the sharp increase in expenses leads to the decline of the index. According to the annual report disclosure in recent years, Dahua attributed the reasons for the increase and decrease of profits to the overall economic environment recovery difficulties and twists and turns; innovation business R&D costs, sales strategy layout and other related costs growth. In fact, net profit is rising every year, in addition to 2018 is 8%, 2013-2019 is more than 15%. From the annual report disclosure, R&D investment seems to play a great role in the company's operating efficiency, the annual growth of R&D costs lead to increased costs and reduced profits, and once R&D results, Realized income can also increase the company's profits on a large scale.

Dahua launched a large intelligent storage solution with integrated monitoring and management platform integrated machine DSS7016 series as the core in 2013. Its financial performance indicators have no obvious growth phenomenon. In 2016, the chip CVI standard series was continuously launched. In the following year, profitability improved significantly, but the overall net profit is growing. It shows that the impact of R&D investment on financial performance is positive.

## 2. Impact of HTC R&D intensity on financial performance

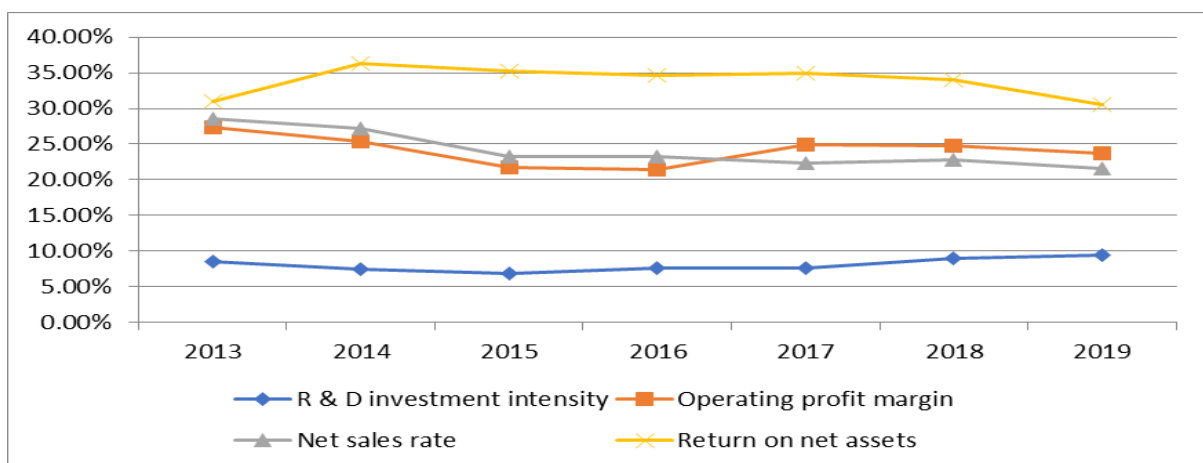


Figure 4.2 Changes in R&amp;D intensity and profitability of Hikvision, 2013-2019

Combined with the R&D investment intensity of Hikvision, it can be seen from figure 4.2 that the profitability index of Hikvision began to rise from 2013 to 2016, but the profitability index of 2017-2019 showed a downward trend. The profitability index of Hikvision is obviously higher than the industry average. Under the environment of poor overall benefit of the industry, Hikvision's profitability is better and maintains the position of industry first.

Through the annual report of Hikvision, it can be seen that the impact of the release of new products on the profitability of enterprises is lagging behind, which is because the new products will continue to improve and mature over time. And the corresponding financial indicators such as gross profit rate, return on net assets will begin to rise gradually. At the same time, the growth rate of main business cost is lower than that of operating income, while the growth rate of sales expenses and management expenses is higher than that of operating income. Visible Hikvision in 2016 in cost control performance, but also inseparable from the company's strong support for R&D innovation. In 2018, Hikvision made a lot of investment in R & D, and the profitability of 2018 did not increase, which also shows that there is a lag effect in the improvement of R&D to the profit of enterprises.

The most direct result of R&D activities is the improvement of output or technology of new products, thus increasing operating income or reducing cost and expenditure, which has an impact on the profit level of enterprises. Therefore, the intensity of R&D investment has the greatest impact on the profitability of enterprises. Innovation to the enterprise's profitability is obvious. However, with the enterprise without new product output, R&D investment gradually increased, financial performance improvement space is small.

### **3. Impact of R&D investment on financial performance of Dahua and Hikvision**

Both are technology-driven to develop core competitiveness; its annual R&D investment has been ranked in the top three security industry.

First of all, because the two companies focus on technological innovation and marketing promotion, R&D investment remains at an effective high level. Secondly, because of the high investment in technology research and development, the two companies have the core technology of leading industry, have the right to price in the market, can subdivide the market by price, thus affecting the pricing or sales of products. The product has higher gross profit, again, the higher sales gross profit enterprise can have more funds to invest in the research and development, develops more new products, achieves the virtuous circle function. The stable growth of R&D expense rate mainly comes from good financial performance and strategic positioning. The two companies have entered a virtuous circle, with stable and sustainable growth in financial performance. But the size of the two companies is different from that of Dahua and Hikvision, which is slightly better at the overall level.

When R&D investment forms new products, Dahua Company and Hikvision Company's financial performance changes are inconsistent. In 2013, Dahua launched a new series of integrated monitoring and management platform integrated machine as the core of large intelligent storage solutions, its financial performance is not like Hikvision launched the "fluorite" series, the return on net assets has achieved a higher growth. But in 2016, Dahua introduced a standard series of chips CVI, and the company's return on net assets and operating profit margin increased significantly. It shows that R&D investment in various enterprises has a different impact. But the same is, the continuous increase of R&D investment and the continuous improvement of R&D efficiency will affect the continuous acceleration of R&D output and the continuous increase of new products, which will make the enterprises keep progress in the industry competition and not be eliminated by the market.

#### **4. Differences in R&D Investment between Dahua and Hikvision**

##### **(1) The difference between the total R&D investment of Dahua and Hikvision**

With the continuous investment in R & D, the amount of R&D investment is increasing, 2019 is 5.5 times higher than 2013, R&D intensity remains steady growth, the compound growth rate is 10. The amount of R&D investment in Hikvision increased 5.9 times in 2019 compared with 2013, and the R&D intensity maintained a steady growth rate of 8%, because the scale of the enterprise is large and the R&D intensity is not as high as that of Dahua Company. In 2019, the total R&D investment of Dahua was 2.794 billion yuan, the total R&D investment of Hikvision was 5.483 billion yuan, and the total R&D investment of Hikvision was twice that of Dahua Company. It shows that Hikvision has great advantages in total R&D investment.

#### **5. Differences in R&D staff input between Dahua and Hikvision**

##### **(1) Differences in R&D personnel to total staff**

Dahua and Hikvision R&D personnel account for a relatively stable growth rate, but the overall proportion of R&D personnel in Dahua is higher than that in Hikvision, with 52.43% in 2019. Hikvision R&D personnel account for 47.19, the gap is about 5%, here Dahua dominates. But from the total number of R&D personnel, Dahua Company and Hikvision are quite different. In 2019, the total number of R&D personnel of Dahua Company is 7161, the total number of R&D personnel of Hikvision is 19065, and Hikvision is 2.6 times that of Dahua Company. In terms of the proportion of R&D personnel, the difference between the two companies is small, because of the different size of the enterprise, Shanghai Kangwei as a whole occupies a greater advantage.

(2) Differences in the ratio of the number of persons with bachelor's degree or above to the total number of employees

In 2019, the ratio of undergraduate and above to total staff was 72.97, and the ratio of Hikvision undergraduate and above to total staff was 70.01. The difference between the two companies is small, indicating that both companies pay attention to the introduction of talent.

#### **6. Difference of R&D investment in profitability between Dahua and Hikvision**

When R&D investment forms new products, the changes of financial performance of Dahua Company and Hikvision Company are different, mainly reflected in the different financial indicators of time and impact. New products have a complete life cycle, which will experience entry, growth, maturity and decline, four stages, each stage can create a different value for the enterprise, so the impact of R&D investment on profitability is different.

The obvious difference between Dahua Company and Hikvision is that in 2103, when the new product of Dahua Company was launched, the profitability index did not change obviously, while when Hikvision introduced the new product, with the promotion of the product in 2014, the profitability changed obviously. In 2016, both companies introduced new products, which created different values, so that the two companies affected different profitability indicators.

## **Conclusion**

### **1. Increased R&D investment contributes to financial performance**

Through the analysis of R&D investment and financial performance of the two companies, it is found that R&D investment can improve the financial performance of the enterprise. From the financial indicators of the enterprise, we can see that the profitability and development ability of the company have been improved to varying degrees. However, the competition between security enterprises is becoming more and more fierce, and there are trade disputes in Chinese overseas markets, which has a certain impact on the profits of enterprises. From the point of view of enterprise financial index, R&D investment has a

positive effect on enterprise performance at the overall level.

## **2. Differences in financial performance between Dahua and Hikvision R&D investments**

(1) The impact of R&D investment by Dahua and Hikvision on financial performance indicators is different.

When the new product was developed, the financial performance indicators of Dahua and Hikvision were different, among which the operating profit margin and the return on net assets were affected by Dahua, while the return on net assets was affected by Hikvision.

(2) Inconsistency in the timing of the impact of R&D investment on financial performance of Dahua and Hikvision

Because the enterprise carries on a large amount of R&D investment every year, the time of forming new products is different from the value created, and the time of affecting financial performance is different. Dahua and Hikvision have the difference between new product output at the same time: when new product output was produced in 2013, there was no significant change in the profitability index of Dahua, while Hikvision's return on net assets increased significantly. In 2016, the profitability indicators of the two companies changed significantly, showing a positive growth trend.

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