

The Impact of Technological Innovation Based on Dynamic Capability on the Profitability of G Company

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ABSTRACT

In the process of technological innovation, enterprises will inevitably need to constantly change and coordinate their ability, and the change of this ability often has the characteristics of dynamic change. The problem studied in this paper is the impact of changes in the form of technological innovation on profitability while enterprises are constantly changing their dynamic capabilities. Based on the analysis of the evolution of G Company's three dynamic capabilities of marketing learning, independent innovation and resource absorption, this paper further explores the impact of three technological innovation modes of learning, independent research and resource integration on enterprise profitability, and forms a reasonable conclusion.

Keywords: *Dynamic capability, Technological innovation, Profitability.*

1. INTRODUCTION

Dynamic capability is a kind of elastic capability that enterprises continuously establish, adjust and reorganize their internal and external resources and intelligence to achieve competitive advantage [1]. It is the ability to change enterprise capability and has pioneering power in innovation. Technological innovation refers to innovation for the purpose of creating new technology or innovation based on scientific and technological knowledge and its created resources [2], [3]. Through technological innovation, enterprises can apply advanced technology to production, so as to enhance the quality of products and services, meet the needs of more consumers, and then promote the growth of enterprise profitability [4], [5]. In the development of enterprises, dynamic capability will change constantly [6]. Different forms of technological innovation under the change of dynamic capability have great differences in the impact on profitability [7]. This paper mainly selects sales gross profit margin, operating profit margin and other indicators to measure profitability.

2. EVOLUTION OF DYNAMIC CAPABILITY OF G COMPANY

Company G was founded in 1991 and listed on Shenzhen Stock Exchange in 1996. Company G occupied the market through air conditioners in the early stage. Over the years, Company G has been consistently committed to the production and R & D of air conditioners, including 9 commercial series and more than 1000 varieties, which are exported to more than 160 countries and regions. At the same time, it has more than 1100 patents at home and abroad. The market share of air conditioning production and sales for many consecutive years ranks first in the domestic air conditioning industry. Now it has developed into a diversified household appliance enterprise producing a variety of products such as air conditioning, intelligent equipment and household appliances. With the development of G Company, its dynamic capability is constantly changing. The number of patents in different development stages is shown in the "Table 1".

Table 1. Number of patents of Company G

Time	Development stage	Number of patents applied	Proportion of invention patents
1991~2001	Initial stage	148	4%
2002~2011	Rapid growth stage	4259	21%
2012~2018	International branding stage	33571	47%

a data sources: Annual report of G Company

2.1 Dynamic Ability with Marketing Learning as the Core

In the initial stage (1991~2001), the number of patents applied by G Company is very small, the proportion of invention patents is not high, the products are produced by traditional production technology, and many patents are obtained by external resources. Gradually upgrade to high-level technology through continuous accumulation of technical capacity. Innovation mainly comes from imitating external technological innovation. Profitability mainly depends on some markets brought by good marketing strategies. Its products do not have core competitiveness and have no obvious advantages in product functions and types compared with other enterprises. Its dynamic ability is mainly the ability to learn the production technology of other advanced companies and the ability to formulate good sales strategies.

2.2 Dynamic Ability with Marketing Learning as the Core

In the rapid growth stage (2002~2011), the number of patents applied for by Company G has significantly increased, and the proportion of invention patents has also increased from 4% to 21%. Company G began to have its own R & D ability, and gradually shifted from low price and high quality to high-tech products. Company G first established an independent R & D system and set up overseas technology R & D bases to better understand the external market demand; At the same time, introduce foreign advanced R & D tools to improve the speed of technology R & D; We have paid attention to the cultivation of R & D talents and formulated a variety of policies to attract and cultivate talents. In 2005, by analyzing the structure of centrifuges of foreign enterprises, G Company successfully developed the first domestic centrifugal compressor with independent intellectual property rights, filling the gap in the domestic market. In 2009, the two-stage permanent magnet synchronous frequency conversion centrifugal unit developed by G Company was identified as the international leading level, and the

innovative technology has made great progress. Its dynamic ability can have changed from marketing learning to independent innovation.

2.3 Dynamic Capability with Resource Integration as the Core

In the international branding stage (2012~2018), the number of patents of Company G has ushered in a huge leap. By 2018, Company g had applied for 33571 patents, and invention patents accounted for 47%. Its technological innovation ability has become mature and has efficient independent R & D ability. After gaining a firm foothold in the domestic market, it has turned its attention to the international market. At the stage of international branding, G Company already has a fairly perfect independent R & D system and a large number of excellent technical R & D talents. G Company's technological innovation ability has reached a high level, and further enhances the enterprise strength by absorbing external resources. In 2018, Company G acquired Jinghong electric appliance, a refrigerator manufacturer, which is a huge improvement in refrigerator manufacturing technology, is conducive to the development of diversified electrical appliance enterprises, and also improves the innovative technology ability of refrigerators. In 2019, Company G invested heavily in obit and Huada Beidou. The main businesses of these two enterprises are navigation and positioning chips and artificial intelligence, which greatly improves the chip innovation ability of Company G. Its dynamic capability has also changed from a single technological innovation capability to resource integration capability.

3. FORM OF TECHNOLOGICAL INNOVATION BASED ON DYNAMIC CAPABILITY

In the initial stage of G Company, the form of technological innovation can be summarized as learning technological innovation; In the stage of rapid development, the dynamic capability of G Company is mainly product innovation capability and production technology innovation capability,

the proportion of learning capability has decreased greatly, and the form of technological innovation has gradually changed from imitating other products to independent research and development; In the international branding stage, the dynamic capabilities of Company G are mainly resource absorption and resource reconstruction. Many technological innovations are no longer obtained through long independent research and development, but through external resources. The form of technological innovation can be called resource integrated technological innovation.

3.1 Learning Technology Innovation

In the initial stage, the resources of Company G are mainly concentrated in product production and marketing, and the technical level is not superior to other enterprises in the same industry. Therefore, Company G chose to buy foreign centrifuges and compressors for assembly, imitate the shape and structure of other best-selling products, implement the marketing strategy of small profit and quick turnover, and initially enter the electrical appliance market with the characteristics of high quality and low price. In the stage of learning technology innovation, G Company's innovation is mainly through imitation learning, mostly local innovation, and there is no major breakthrough in core electrical components.

3.2 Independent R & D Technological Innovation

In the rapid development stage, G Company has gradually built a competitive independent technological innovation system with the technology and funds accumulated in the early stage, which is mainly divided into independent R & D system and independent marketing system. The innovative technology of G Company no longer depends on imitating and learning other existing technologies, but completely relies on its own R & D base for independent R & D. the form of technological innovation has become independent R & D. In the stage of independent R & D technological innovation, G Company's innovation is mostly the first in China, and focuses on air conditioning products, such as manufacturing China's first centrifugal unit and high-efficiency compressor.

3.3 Resource Integrated Technological Innovation

In the international branding stage, G Company has a perfect independent innovation system. Relying on the previously accumulated technical foundation and using a variety of information platforms, G Company combines a variety of technical resources with the differentiation of market demand to realize the integration of market demand and product technical resources. The form of technological innovation of G Company has gradually changed from the previous single independent R & D type to the resource integration type. In the resource integration stage, many innovations of Company G are inseparable from the help of external resources. For example, through the acquisition of Zhuhai Yinlong, Company G quickly obtained its core technology of lithium titanate material, which plays a long-term role in the development of new energy appliances of Company G.

4. INFLUENCE OF DIFFERENT FORMS OF TECHNOLOGICAL INNOVATION ON ENTERPRISE PROFITABILITY

This paper mainly selects two indicators: operating profit margin and gross profit margin to measure the impact of different forms of technological innovation on profitability. "Figure 1" shows the changes of G Company's sales gross profit margin and operating profit margin.

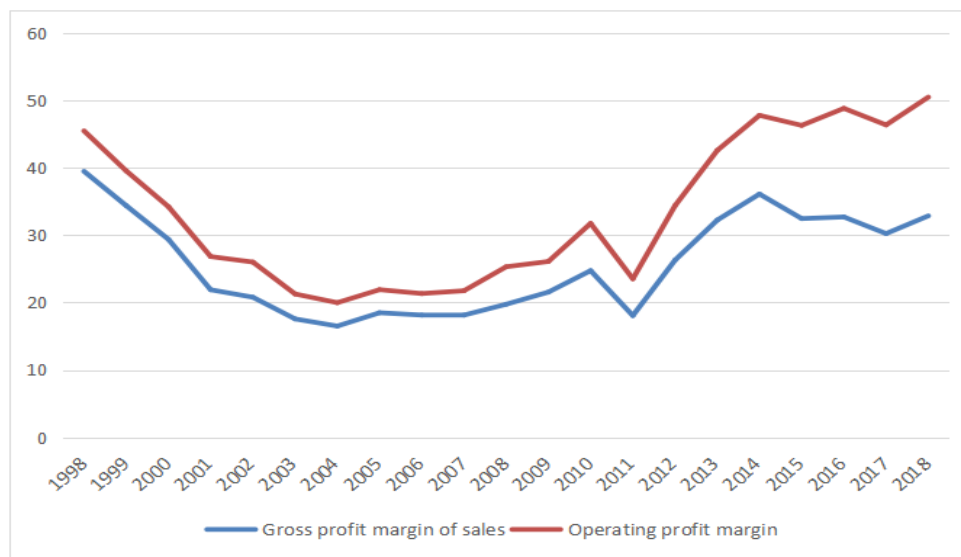


Figure 1 G Company's gross profit margin and operating profit margin.

a data sources: Annual report of G Company

4.1 The Influence of Learning Technological Innovation on the Profitability of G Company

In the initial stage of G Company, its gross sales margin and operating profit margin decreased from 39.47% and 6.00% in 1998 to 21.89% and 4.92% in 2001 respectively. Among them, the operating profit margin rebounded slightly in 2001, but it still showed a downward trend on the whole.

First, the product structure is single, the core components rely on imports, and the profit space is small. The focus of G Company's initial production is air conditioning, trying to occupy the market through high-quality air conditioning. However, this policy only makes G Company initially enter the market and has no advantage in competition with other similar products. At the same time, the single product category also limits the profitability of G Company. It can be seen from the data in "Table 2" that the products of Company G in the initial stage are mainly composed of air conditioners, and the operating revenue accounts for 70%, while other types of products account for only a small proportion. The competitiveness of air-conditioning products to some extent represents the market competitiveness of G Company at that time. Due to the lack of independent innovation, most of the innovation of G Company's air-conditioning comes from learning and imitation, and many key components such as centrifuges and compressors are purchased from abroad, so the profit space is not large, and there is no competitive advantage

compared with other similar products. At the same time, G Company lacks investment in other fields of household appliances. In the fierce market competition environment, it is unable to rely on diversified products to deal with market risks. Therefore, after foreign brands entered the Chinese market, G Company's air-conditioning products lacked competitiveness, the profit margin and gross profit margin continued to decline, and the profit space was further compressed. It can be seen that one of the disadvantages of learning technological innovation is that it is difficult to make products obtain real core competitiveness.

Second, product innovation is in the imitation stage, lack of core competitiveness, and the low price strategy gradually fails. At this stage, G Company mainly invested the product R & D expenses in the field of air conditioning, increased the investment of operating expenses, and tried to occupy the market share through good marketing means. However, many international well-known brands such as Panasonic and Siemens have entered the Chinese market, further compressing the domestic market share. The entry of foreign household electrical appliance enterprises has also led to a sharp rise in the price of raw materials. Company G's previous policy of trying to reduce the price through cost management to attract consumers has also been greatly hindered. The increase of cost has further reduced the profit margin of Company G, and the profit of Company G's products has become smaller and smaller. In the stage of learning technology innovation, G

Company's product innovation is still in the period of imitating and learning the products of other international enterprises. This innovation is a single and greatly limited innovation, which can not really

make the enterprise have the core competitiveness, it is difficult to deal with the fierce market competition, and the profitability of the enterprise gradually decreases.

Table 2. Proportion of G Company's operating revenue from 1999 to 2001

Date \ Product	air conditioner	Refrigerator	Freezer	Small household appliances
December 31, 1999	70.42%	16.53%	8.32%	4.73%
December 31, 2000	72.13%	16.60%	8.56%	2.71%
December 31, 2001	73.45%	16.72%	8.61%	1.22%

a data sources: Annual report of G Company

4.2 The Influence of Independent R & D Technological Innovation on the Profitability of G Company

In the stage of rapid development, the profitability of Company G has improved to a certain extent. Its gross sales margin and operating profit margin increased from 17.56% and 3.70% in 2003 to 24.73% and 7.01% in 2010 respectively. Although there are some fluctuations, it still shows an upward trend on the whole.

First, produce diversified products that meet market demand through independent innovation. When the market demand is constantly changing, G Company develops products that meet the market demand through independent innovation, so as to expand the market share and improve the operating profit margin. At this time, Company G no longer attracts consumers through price by virtue of cost advantage, but meets the changing needs of consumers by developing high-tech products, occupies the high-end consumer market, obtains high profits with high-quality and diversified products, improves gross profit margin and operating profit margin, and improves profitability. From 2002 to 2011, G Company's operating profit margin has been steadily improving, which is largely due to the unique advantages of G Company's innovative products, which can bring huge profit space to G Company, and then drive the improvement of operating profit margin. It can be seen that independent R & D technological innovation can help enterprises manufacture high-tech products in leading industries, obtain market core competitiveness, and then improve the profitability of enterprises.

Second, improve brand positioning with independent innovative products. G Company has established an independent innovation system by setting up a technology R & D center and

introducing high-end talents. Relying on its own technology R & D ability, G Company has developed a number of innovative technologies, manufactured products to meet the high-end needs of consumers, and created a series of high-end variable frequency air conditioners such as G Company's leadership, Runhui and Tianji. In 2010, the share of G Company's air conditioner in the international market was as high as 11.1%, ranking third in the world. In 2011, G Company's central air conditioning accounted for 11.4% of the domestic market, ranking first in the industry for two consecutive years. These data show that Company G has established its leading position in China's high-end market, improved its gross profit margin and profit margin, and effectively improved its profitability by independently developing innovative technologies and applying science and technology to products.

4.3 The Influence of Resource Integrated Technological Innovation on the Profitability of G Company

In the international branding stage, the sales gross profit margin and operating profit margin of Company G increased significantly compared with the previous period, from 18.06% and 5.46% in 2011 to 32.70% and 16.11% in 2016 respectively. Except that the gross sales margin fluctuated between 2013 and 2015, the two data changes in the rest of the time showed a state of continuous growth, with a large increase. At this stage, the innovation form of G Company is mainly resource integration innovation with resource absorption capacity as the core. The characteristic of this type of technological innovation is to obtain innovative technology by integrating the technological resources of invested or acquired enterprises. Taking Company G's acquisition of Jinghong electric appliance in 2018 as an example, Jinghong

electric appliance is a home appliance manufacturer with refrigerators as its core products. Its refrigerator technology occupies a dominant position in the market, with an annual sales volume of millions. Through the main business composition of Company G in the table, it can be found that although the product structure of Company G has been optimized, air conditioning still accounts for a large proportion. If Company G wants to continue to break through the upper limit of enterprise development, it has to improve its profitability by developing diversified products. Through the acquisition of Jinghong electric appliance, G Company's refrigerator manufacturing technology has been rapidly improved, and then launched G Company's "Jinghong 325 instant frozen refrigerator" series, which has made great progress in the field of refrigerator products, not only occupying more market share, but also improving G Company's profitability. It can be seen that resource integrated technological innovation can help enterprises optimize the industrial structure and quickly obtain innovative technologies, so as to improve the profit margin and gross profit margin. Therefore, resource integrated technological innovation has a positive impact on the profitability of enterprises.

5. CONCLUSION

5.1 *The Negative Impact of Single Learning Technological Innovation on Enterprise Profitability*

In the initial stage of G Company, its dynamic ability is mainly learning ability and marketing ability. Therefore, the form of technological innovation is limited, mainly through imitating and learning the product technology of other enterprises. The product technology obtained through imitation is not competitive in the market. When foreign enterprises with leading product technology enter the market, they will be robbed of market share and have to maintain sales by reducing the selling price, resulting in the decline of the profitability of the enterprise. At the same time, a single learning technological innovation will also have an adverse impact on the growth ability of enterprises. Due to excessive dependence on marketing strategy and cost management, it will be difficult for enterprises to deal with when market risk factors such as the rise of raw material prices appear. By analyzing the profitability index of G Company, it can be seen that under the environment of learning technological innovation, its sales gross profit

margin and operating profit margin continue to decline. Single learning technological innovation will have an adverse impact on the profitability of enterprises.

5.2 *Positive Impact of Independent R & D Technological Innovation on Enterprise Profitability*

In the rapid development stage of G Company, its dynamic capability is mainly product innovation capability and production technology innovation capability. The form of technological innovation has gradually shifted to independent research and development. G Company mainly innovates products and manufacturing technology through its own R & D base. This form of innovative technology is often unique to Company G, so it has strong market competitiveness. Through the profitability index of Company G, it can be found that under the environment of independent R & D technological innovation, its sales gross profit margin and operating profit margin increase year by year, which indicates that the profit space of its products is becoming larger and larger, and also means that the profitability of the enterprise is becoming stronger and stronger. Its anti risk ability has also been steadily improved. Independent R & D technological innovation has a positive impact on enterprise profitability.

5.3 *Resource Integrated Technological Innovation Has Significantly Improved the Profitability of Enterprises*

In the international branding stage of G Company, its dynamic capability is mainly resource reconstruction capability and resource absorption capability. The main form of technological innovation has changed from independent R & D to resource integration, mainly to quickly obtain technological innovation by absorbing external resources. This form of technological innovation can quickly obtain the core technologies of other enterprises and make up for their own shortcomings. By analyzing the profitability indicators before and after the acquisition of Jinghong electric appliance by G Company, it can be found that its sales gross profit margin and operating profit margin have been significantly improved. At the same time, the industrial structure of G Company has been optimized, its profitability has been improved and its ability to deal with market risks has been enhanced. Absorbing external resources is also of great help to the development of G Company's

growth ability. Resource integrated technological innovation has greatly improved the profitability of the enterprise.

This paper studies the relationship between technological innovation and profitability based on dynamic capability, which will help enterprises in different stages choose appropriate ways to improve technological innovation capability, so as to improve market competitiveness and profitability. However, because this paper only selects G Company for case study, the conclusions are not necessarily universal and need to be further studied.

AUTHORS' CONTRIBUTIONS

This paper is independently completed by Runxiao Zhang.

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