The Path of Innovation Drive Enterprise Capability Improvement—A Case Study of Haier Group

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Keywords: Innovation-driven, Innovation capability, Path, Case study.

Abstract. Innovation is the first impulse to lead development under innovation driving. Most enterprises face difficult position of weak innovation capacity in China. Through the long-term tracking study of Haier for more than 30 years, this paper takes the development main contradiction as the main line, it analyzes and summarizes the Haier Group’s path of improving innovation capacity under the background of transformation. This study found that the single technological innovation capability is mainly through the introduction imitation, digestion and absorption of technology in the early stage of Haier, with the change of the major contradiction, the innovation capability gradually becomes the combination innovation capability in the stage of diversified strategy, the stage of globalization marks the beginning of total innovation in Haier, and get into the stage of total innovation management. Therefore, the innovation capability has gone through three stages, it from the single technological innovation ability to the combinational innovation capability, and developed into total innovation at finally.

1. Introduction

China’s manufacturing industry is in the stage of transformation and upgrading, it is normal that multinational companies of developed countries blockade on knowledge and technology of China’s manufacturing enterprises, and the vertical specialized division did not achieve the goal of upgrading China's manufacturing enterprises, instead it will be caught in the captive product value chain of developed countries, which contain the pace of industrial upgrading. To this end, China should follow the path of independent innovation with its own characteristics, launch a series of major measures for the reform of the scientific and technological system, form its own core technologies in an open environment, constantly improve its innovation capabilities, strengthen the integration of innovation-driven system capabilities, and gradually develop into core capabilities. In the report of the 19th National Congress of the Communist Party of China, General Secretary Jin-Ping Xi stressed that to implement the innovation-driven development strategy, we must improve our capacity for independent innovation and build an innovation-originated country, which is the core of the national development strategy.

Prahalad and Hamel (1990) first put forward the core competence theory: in order to survive and further develop, enterprises must have differences in terms of products or services [1]. Innovation capability is not only a specific organizational resource [2], but also involves multiple factors, such as organizational factor, market factor, technical factor, management factor, institutional factor, cultural factor, etc. If we only consider the innovation concept of a single technological factor, then it is a one-sided understanding of innovation capability[3] ;at the same time, it is a process of dynamic resource allocation, which will show different forms in different periods[4,5,6], this point is the same as the dynamic capability theory of Teece [7,8]. Capability is gradually evolving, and it is a process from quantitative change to qualitative change[9,10]. In 1994, Jin Chen put forward the concept of independent innovation. He regarded independent innovation as a way of technology innovation that was to be brought in, digested, and absorbed, then to be innovated [11]. Afterwards Xiao-Bo Wu further expanded the concept of independent innovation, he thought innovation can be divided into three categories, which respectively were second innovation, integrated innovation.
and original innovation[12], and academician Qing-Rui Xu pointed out in his research on evolution paths of Haier's innovation capability, that innovation capability of Haier underwent the three stages which were secondary innovation, integrated innovation and original innovation[13]. Xiao-Qing Zhao et al. also pointed out that the evolution of technological innovation capability of enterprises would go through three stages: imitation, creative imitation and independent innovation[14]. In aspects of the measurement of innovation capability, many scholars have also carried out studies, which can be measured from the perspective of the intensity of research and development capital investment and the number of patents obtained[15], and the measurement of innovation capability should reflect the systematisms and combinatorial structure of innovation activities[16]. Based on this, this paper analyzes and summarizes the path to improve its innovation capability by adopting the longitudinal case study method with the innovative and practical benchmark enterprise Haier Group as the research object. Moreover, this paper points out that the role of a single technology innovation capability is limited from the perspective of system management and dynamic management, instead it should improve enterprise innovation capability from the perspective of combinatorial innovation management and total innovation management, and further indicate that the way to improve the innovation capability is from single technical capability to combinatorial innovation capability, and then to total innovation capability. The structure of this study is as follows: the second part describes the research methods and data sources; the third part discusses the path of improving innovation capability; the fourth part extracts the research conclusions, points out the limitations of this study and the prospects for the future.

2. Research Methods and Data Sources
The main methods adopted in this study include semi-structured interview, questionnaire survey, tracking study, referring to the related literature, etc., as shown in table 1.

Table 1. Research methods and data resource

<table>
<thead>
<tr>
<th>Research method</th>
<th>Data resource</th>
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<tbody>
<tr>
<td>Semi-structured interview</td>
<td>Many leaders were interviewed by us</td>
</tr>
<tr>
<td>Questionnaire survey</td>
<td>We design the questionnaire of “To leverage innovation capabilities of Chinese small-&amp; medium-sized enterprises by total innovation management”</td>
</tr>
<tr>
<td>Tracking study</td>
<td>The innovation management team of Zhejiang University has accumulated much data in the last thirty years</td>
</tr>
<tr>
<td>Referring to the related literature</td>
<td>We got information through search engines</td>
</tr>
</tbody>
</table>

Semi-structured interviews: many senior leaders and middle managers of Haier Group accepted our interview. For instance, during the summer vacations in 2017 and 2018, the team led by academician Qing-Rui Xu personally worked at Haier for several months for investigation and research. In the meantime, the interview objects including vice president of Haier Household Appliances, the head and a number of staff of HOPE platform (many sessions), the head and staff of Haier patent platform (many sessions), helped us get a lot of useful information, and provided a large number of firsthand material for our study, which enhanced the credibility of our research.

Questionnaire survey: the academicians of the Chinese academy of engineering professor Qing-Rui Xu and professor Bin Guo, jointly designed the questionnaire of “using total innovation management to improve the innovation capability of Chinese small and medium-sized enterprises”. Only those who conform to the following characteristics will be taken as the objects of our investigation: having worked in Haier for more than 15 years, having a deep understanding of problems, mastering comprehensive and accurate information, and having higher rank or working seniority in Haier Group, these characteristics ensure the accuracy of the information we collect to the greatest extent.

Tracking Study: academician Qing-Rui Xu has led the team members of the innovation and
development research center of Zhejiang University to conduct tracking research on Haier for nearly 30 years, and accumulated rich experience and data.

Referring to the related literature: using search engine to obtain academic articles about Haier from CNKI, and through collecting and investigating Haier's annual reports, employee handbook, Haier's official weekly reports, magazine articles, works and other materials and data, analyze the development path and achievements of Haier.

3. Case Analysis

3.1. Case Company Introduction

Haier Group was established in 1984. It has been more than 30 years old. From the very beginning, a small group of insolvent and close-going small factories have become the world's white goods maker and China's most valuable brand after years of innovation and development. Haier Group has already become a large multinational enterprise group. It has established 24 industrial parks, 10 R&D centers, 108 manufacturing centers and 66 marketing centers around the world. The number of employees worldwide has exceeded 60,000. Haier Group's business is also expanding, from the initial home appliance field to the current communications, IT products, house, logistics, finance, real estate, bio-pharmaceutical and other fields. It is selected to the most successful Chinese brands in the overseas market with Lenovo, Alibaba, China International Airlines and other leading brands in various industries.

The enhancement of Haier’s innovation capability was generated with the transformation of contradiction caused by environmental changes at different periods of Haier. In the early stage, by means of assigning technicians to study and exploring in practice, Haier was established in the market relying on its differentiated product quality through digestion and absorption, and then implantation of the innovative genes of Haier, and became the leader in the industry of domestic electrical appliances, of which the main performance is single technical capacity. The following thing that Haier confronted was the contradiction between diversified needs and single product as contradiction, as well as the contradiction between the main internal organizational structure and innovation efficiency. The measures taken by Haier were to promote the integration of technology and market, as well as the integration of organization, management and system, which were mainly manifested as combinatorial innovation capability. With the expansion of company scale, the organizational structure has become more and more complex, and the contradiction between enterprise development and enterprise inertia has become more and more prominent, which requires to set up the total innovation capability. The major contradictions and major innovation capabilities at each strategic stage are shown in table 2.

<table>
<thead>
<tr>
<th>Strategic stage</th>
<th>Major contradiction</th>
<th>Major innovation</th>
<th>Major capability</th>
</tr>
</thead>
<tbody>
<tr>
<td>famous brand strategy</td>
<td>Between strong social demand and product quality problem as contradiction</td>
<td>Single element innovation</td>
<td>The capability of single technical capability</td>
</tr>
<tr>
<td>diversified strategy</td>
<td>Between diversified needs and single product as contradiction</td>
<td>Combination innovation</td>
<td>The capability of combination innovation</td>
</tr>
<tr>
<td>internationalization strategy</td>
<td>Between main internal organizational structure and innovation efficiency as contradiction</td>
<td>Total innovation</td>
<td>The capability of total innovation</td>
</tr>
<tr>
<td>globalization strategy</td>
<td>Between supply and demand in the home appliance market as contradiction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>networking strategy</td>
<td>Between enterprise development and enterprise inertia as contradiction</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In order to coordinate the contradictions in various aspects, Haier has developed from the previous single and combinatorial innovation capability to total innovation capability, which is actually a process from quantitative change to qualitative change for the development of innovation capability, as shown in Fig.1.

**Figure 1.** Haier’s innovation ability improvement path

### 3.2. Single Technical Capacity: From the Late 1980s to 1993

In the late 80s and early 90s, the Chinese electrical appliances industry appeared a strange phenomenon in respect of technology or equipment, namely in the “introduced - backward-repeatedly introduced- repeatedly backward” cycle. But at the moment, the executives of Haier Group had already realized the seriousness of this problem that the introduction of complete sets of technical standards was just a pure mechanical introduction which couldn’t be relied on, the industry itself must have the capability to transform core knowledge. Hence, Haier decided to adopt the methods of exploring in practice and learning in utilization, and assigned technical staff to Liebherr Company in Germany to get trained over the next six years, with the purpose of hopefully grasping some of the key technology in the use process of production line, as well as constantly digested and absorbed to make itself possess the replication capacity of core technology. At this stage, the innovation capability of Haier was mainly based on the introduction of foreign advanced production technology and equipment, and then conducted digestion and absorption through the methods of exploring in practice and learning in utilization, further implanted the innovative genes of Haier, at the same time payed attention to the quality of the products, so as to become a leader in the field of domestic home appliances market.

### 3.3. Combinatorial Innovation Capability: From 1994 to 2005

With the change of the main contradiction, the strategy of the group also changed. In the process of the development of the enterprise, the executives realized that the role of a single technical capacity was limited, and relying on a single technical capacity cannot meet the needs of the development of the enterprise. If an enterprise wants to achieve benign development, its innovation capability often appears in the form of group. Only through their organic combination and synergistic effect can it promote the efficient and sustainable development of the enterprise. Thus the executives began to pay attention to the importance of combinatorial innovation. Through combinatorial innovation, the core competence of the enterprise can be translated into the market advantage, thus to improve their capability of technology innovation, and combine some of the enterprise elements (e.g.,
organization, management, system, market, technology, etc.) to foster and form the core competence of enterprises at the same time, the relationship between the combinatorial innovation and core competence is shown in Fig.2.

![Figure 2. Relationship between portfolio innovation and core competencies](image)

Combinatorial innovation is a kind of systematic collaborative innovation behavior restricted by technological factors and organizational factors, which can be divided into three levels, namely the combination of technological innovation and product innovation, the combination of major innovation and gradual innovation and the combination of recessive innovation benefit and dominant innovation benefit. At this point, we divide the combinatorial innovation capability of Haier mainly into two stages, namely the early stage (1994-1998) of combinatorial innovation and the later stage (1999-2005) of combinatorial innovation, and analyze the combinatorial innovation capability of Haier from three levels, which are the business level, the organization and management level, as well as the ideological and cultural level, which corresponds respectively to the combination of technology and market, the combination of organization, system, management and so on, the combination of strategy and culture, as shown in Fig.3.
3.3.1. The Combination of Technology and Market

Market-driven innovation has always been Haier's strength. Haier attaches great importance to market survey and research, attaches great importance to users' opinions, and improves its product market by constantly accumulating data, utilizing the differences between markets and its own innovative ideas and technologies. For example, as for the washing machine, a female customer complained that the washing machine on the market had a large capacity, which consumed time, electricity and water. She hoped that a small washing machine suitable for modern people could be sold on the market. Haier's policymakers keenly grasped the market information, they not only attached importance to this information, and also carried out a large amount of market surveys and researches on the problems of this information. Finally, the company staff successfully designed the "Little Child Prodigy" washing machines by means of the improvement in technology, research and development, the sales volume of this washing machine in the market was very large, which achieved a huge success. Similarly, there were products such as "no-stoop refrigerator" and "sweet potato washing machine" on the Indian market. Haier greatly improved its core competence through the combinatorial innovation of market competence and technical competence. The modes before and after the combination of Haier's technical competence and market competence are shown in Fig.4.
In the model before the combination of market and technology, we could see that the technology and the market were disjointed, the two were not integrated, and at that time, the process innovation followed the product innovation, this model was likely to lead to the enterprise to produce products that are not needed in the market. Compared with the mode before the combination of market and technology, the mode after the combination closely combined technology and market. Moreover, the technological innovation led the product innovation, and the products were more in line with the needs of the market and consumers.

3.3.2. The Combination of Organization, System, Management and Other Factors

In the famous brand stage, Haier carried out total quality management, the main purpose was to reshape employees’ concept of quality. After Haier entered the diversification stage, its expansion speed was very fast, and the enterprise encountered great challenges in internal management, that was, the enterprise's management system could not keep up with the market development speed. In order to further improve the execution and efficiency of employees, Rui-Min Zhang put forward the OEC management model, the core meaning of which is “never put off till tomorrow what should be done today, which improves more than what was done yesterday”. Since 1999, Haier has entered the stage of “three-step” internationalization strategy. In order to prevent the “big enterprise disease”, it came up with the “SST”, so that every employee in the enterprise could fully feel the pressure from the external market. For the sake of full implementation of the market chain mechanism, Haier conducted a comprehensive and systematic process reengineering, transforming the traditional functional management into market relations and overturning the traditional organization structure. During the five years from 1998 to 2003, Haier adjusted its organization structure 42 times. The implementation of the market chain mechanism improved Haier's capability to respond to the rapid changes in the market and meet the personalized needs of users, accelerated the speed of research, development and innovation, significantly reduced various costs, and remarkably enhanced its international competitiveness.
3.3.3. The Combination of Strategy and Culture

In the support system of enterprise’s continuous innovation, the strategy innovation is the direction, and the cultural innovation is the forerunner, the long-term development and continuous innovation of the enterprise cannot do without the strategic guidance. The strategic innovation can provide enterprises with a better direction, effectively promote synergy between departments, and the cultural innovation has important influence on the idea of enterprise employees. From the late 1990s to 2005, through the process reengineering of SBU(STRATEGIC BUSINESS UNIT), market chain and informatization, a collaborative innovative culture based on strategic vision was formed. In the late 20th century, Haier seized the opportunity of merger and reorganization of enterprises, and implemented merger and reorganization strategy in order to expand the scale of the enterprise. Haier created its own plan for the merger and reorganization of other enterprises, merging in the form of “activating shock fish”, and making those merged enterprises redevelop through the way of “intangible assets to revitalize tangible assets”. At the same time, the “high-level managers regular classes” in respect of the creation and development, as well as the regular meetings three times a week (the domain main meeting on Monday, the small micro main meeting on Wednesday, and the platform main meeting on Saturday), were the unique learning culture of Haier. In regular classes and three-time meetings, the leaders took the lead in learning and demonstrating the philosophy of management and innovation combining with practical work, and analyzed deep-seated contradictions that existed in the decision making and innovation together with employees, formulated really feasible strategy to solve practical problems of enterprises.

After a period of development, Haier achieved good results through the combinatorial innovation of capabilities, and the innovation indexes of each part were significantly improved, as shown in table 3.

Table 3. R&D performance and Market response Speed in the later stage of Combinatorial Innovation ability

<table>
<thead>
<tr>
<th>Years</th>
<th>1999</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>New products value</td>
<td>80%</td>
<td>Over 80%</td>
<td>Less than 82%</td>
<td>Over 85%</td>
<td>Over 85%</td>
</tr>
<tr>
<td>Average number of products per working day</td>
<td>1</td>
<td>1.3</td>
<td>1.5</td>
<td>1.8</td>
<td>1.8</td>
</tr>
<tr>
<td>Turnover rate of current capital</td>
<td>118 days</td>
<td>88 days</td>
<td>83 days</td>
<td>78 days</td>
<td>Less than 78 days</td>
</tr>
<tr>
<td>Purchasing cycle</td>
<td>10 days</td>
<td>7 days</td>
<td>5 days</td>
<td>3 days</td>
<td>Less than 3 days</td>
</tr>
<tr>
<td>Order Processing Time</td>
<td>7 days</td>
<td>1 days</td>
<td>Less than 5 hours</td>
<td>Less than 1 hour</td>
<td>Less than 1 hour</td>
</tr>
<tr>
<td>Number of patents declared per working day</td>
<td>2.2</td>
<td>2.5</td>
<td>2.6</td>
<td>2.67</td>
<td>2.8</td>
</tr>
</tbody>
</table>

3.4. Total Innovation Capability: From 2005 to Present

The essence of total innovation management is the further development of combinatorial innovation management. Haier's success depends on its “comprehensive” management idea. In order to faster and better meet the personalized needs of users on the market, as well as to improve the performance of innovation and core competence, Haier has gradually implemented total innovation management on the basis of total-round factors (strategy, organization, system, management, market, technology and culture), with the main characteristic of total space-time and total-involvement innovation, the relationship between total innovation management and core competence as shown in Fig.5.
There is a close positive correlation among business performance, core competence and total innovation management. The implementation of the total innovation management contributes to improve the enterprise and the staff's innovation capability, innovation impetus, innovative ideas and innovation speed, on the basis of that, the innovation performance of enterprise will also be improved. If improving the innovation performance while meeting the personalized needs of users, the market competitiveness of enterprise will undoubtedly be enhanced, and then the business performance will be improved. In the framework of total innovation management, total-round innovation is the content, total-involvement innovation is the subject, and total space-time innovation is the form of realization.

3.4.1. Total-Round Innovation Capability

Haier's total-round innovation mainly refers to the innovation of those factors such as strategy, organization, system, management, market, technology and culture, by which to enhance Haier's capability. Here, Haier's technological innovation and organizational innovation are mainly described.

Technological innovation is the key. Haier's technological innovation is based on the integration of innovation elements on the total-around open innovation platform. Haier can always produce products required by users before the emergence of a large amount of demand in the market, and it will constantly update and iterate the products, sometimes even faster than the user's imagination. According to our investigation and analysis, Haier achieved such a breakthrough because it not only focused on technical elements, but also took organization, strategy, culture, system and other elements into consideration, integrated various innovative elements for technological innovation, and carried out benign interaction and collaborative matching. The technological innovation capability and its scale of Haier could constantly achieve upgrading, and the technological innovation was successful because of two solid foundations (software foundation and hardware foundation). Haier made full use of and integrated technological resources, on the basis of their technical capabilities, effectively utilized external forces to try to realize the combination of independent research and development with the help of external forces, so as to establish external innovation network center in a global scale to support internal innovation system. At the same time, the enterprise created an internal culture of innovation, encouraging total employees to participate
in innovation and total departments to make collaborative innovation, so as to lay a solid foundation for Haier's innovation. Technological innovation and its supporting system based on the total-round innovation platform are shown in Fig.6.

![Figure 6. Technology innovation based on a total-round innovation platform](image)

Organizational innovation is the guarantee. Strategy determines organizational structure which serves strategy. Haier has put forward different strategies in different periods, and its business mode has been constantly changing. From “process reengineering” to the present win-win mode of “Ren Dan He Yi”, the intermediate carrier to undertake these changes is organizational structure. Haier's organizational structure has transformed from the traditional “upright triangle” to the “inverted triangle”, and then to the current “node closed-loop reticulated structure”. In the pyramid-shaped upright triangle organizational structure, the top of the pyramid is Haier's top leadership, followed by some middle managers and grass-roots managers, and the bottom is the front-line employees who do things according to the instructions of the upper leadership. In order to realize the on-demand business mode with zero inventory, Haier's organizational structure must be changed to allow employees at the top to directly contact the users and the market and make independent decisions. The original senior leaders are at the bottom of the organization, and the middle leaders are greatly downsized. Their main responsibilities are to determine new strategic directions, discover new market opportunities, and change from issuing instructions to providing resources and services, in the meantime coordinating internal organizational relations. This change makes the organizational structure no longer leader-center, but user-center. When Haier established the inverted triangle organization, the 80,000 staff in the group became more than 2000 independent management bodies, which from top to bottom in turn in the inverted triangle organization are: the first-level management body (front-line management body), the secondary management body (platform management body), third-level management body (strategic management body), each management body has independent right to assign staff, distribute and make decisions, the primary roles and responsibilities of total levels of management bodies, are shown in table 4 below.
### Table 4. Roles and responsibilities of the three types of management bodies

<table>
<thead>
<tr>
<th>management bodies types</th>
<th>Important role and responsibilities</th>
</tr>
</thead>
</table>
| third-level management body (strategic management body) | ● Redesign new strategy  
● Identity and create new market opportunities  
● Responsible for the upgrading of total management body  
● Close the gap of second management body |
| secondary management body (platform management body) | ● Provide resources and services to first management body  
● Evaluate the services provided for third management body  
● Close the gap of first management body |
| first-level management body (front-line management body) | ● Respond and meet the demand of users in quickly  
● Identify and create the demand of users  
● Evaluate the services provided for third management body |

In order to provide those who face the market with the fastest resources and the best coordinating internal relations to ensure the market, Haier decided to further change the “inverted triangle” organization into node closed-loop reticulated organization, so that the “inverted triangle” became a net, and the whole Haier became a platform organization. In this platform organization, everyone or management body must become a node in this network organization. If some employees cannot find the node in the network organization, they will become redundant. In order to enter the network organization, they must compete for the employment. The management bodies at total levels are linked together through contractual relationships such as target undertaking, resource exchange and exclusive distribution customization. Their common goal is to create and meet the needs of users and bring added value to users. Every node in the network can feel the users. The user's network is dynamic, because their demand is in constant change, so the network composed by Haier is also dynamic, which implements the dynamic partnership system with survival of the fittest.

#### 3.4.2. Total Space-Time Innovation Capability

The concept of Haier to speed is that user resources are won by speed, and speed is used to seize the market so as to become the first choice of users. Globalization is one of Haier's core capabilities. At present, Haier has ten research and development centers and fifteen production bases in the world. Up to now, the Asian research and development center of Haier has accumulated 477 industrial design patents and technical patents, and the number of industrial design patents of the research and development center in Japan has reached 195, including 104 washing machines and 91 refrigerators. Haier believes that if it wants to succeed in a certain market, then it must develop its operation capacity with the use of local advantages. As Rui-Min Zhang said, “the world is my human resources department, and the world is my research and development department”. Each of Haier's research and development centers is required to rely on the local advantages to carry out their own innovation, committed to research and development of industry-leading products.

In order to integrate global innovation resources, Haier established HOPE platform in 2013. HOPE platform is the core of Haier's open innovation system, which integrates Haier and external innovation through the concept, process and method of open innovation, thus to solve problems for users. The early business of HOPE platform focused on solving technical problems, and as the demand for cross-industry technologies and emerging technologies increased, the business scope of HOPE platform also gradually expanded. At present, the main work of HOPE platform is to integrate global resources and explore new global resources. Currently, Haier has three global resource networks, namely the global first-class modular supplier resource network, the global first-class research and development resource network and the global user resource network, which are integrated to meet the needs of users. Under the influence of the talent’s interaction and resources integration of HOPE, some new industries have been generated such as wireless power supply industry.
3.4.3. Total-Involvement Innovation Capability

Rui-Min Zhang believes that innovative people not only exist inside the enterprise, but also exist a lot outside the enterprise. If their innovative ideas can be used by Haier, then it is certain that Haier can achieve breakthroughs. Therefore, Haier's total-involvement innovation capability not only refers to the innovation capability of enterprise's internal staff, also includes the innovation capability of the partners and users outside the enterprise, which takes the form of “online + registered”, “online” refers to the employees who have signed labor contract with Haier, and “registered” refers to the suppliers and users who registers on Haier's website.

The business mode in the Internet era requires zero distance from users, which is called “end to end” by Haier internally. One end refers to internal employees, while the other end is users. For this reason, Haier puts forward the transformation from “customer” to “user”, there is similarity between two words, but the meanings are very different. Customers may only have one transaction with the enterprise, who are just the consumers of the product terminal, while users will participate in the design and experience of the product, and they become the designers, producers and consumers of the product. Haier attaches great importance to user innovation and puts forward the concepts such as “user stickiness”, “user multiplier”, etc., hoping to promote the improvement of Haier's innovation capability with the help of the wisdom of users. Among them, Haier's COSMOPlat is an intelligent manufacturing system focusing on user innovation and user value, including a number of links such as user experience, order placing, order acceptance, flexible manufacturing and after-sales service. Compared with Siemens of Germany and GE of the United States which pay more attention to the “lights-out factory” and the automation of the manufacturing process, but the main feature of COSMOPlat is to connect the manufacturing system with user innovation and user experience, so as to create a zero-distance system with consumers and turn customers into lifelong users of Haier. Through the interaction with users, Haier has covered the innovation capability of users to their own, such as “Tian zun air conditioning”, “second generation of Yun xi washing machine” and other products launched by Haier in the market, which are total from the user's innovative ideas. These products greatly improve Haier's core competence and market competitiveness, Fig.7 indicates Haier's achievements during the period of total innovation capability.

![Figure 7. Haier Group's 2009-2017 data](image)

It can be seen from the above figure that Haier's global turnover, profit and market share of refrigerators basically manifest a rising trend year by year, among which Haier's market share of refrigerators has ranked first for 10 consecutive years and has been the most valuable brand in China for 16 consecutive years. The income of Haier Group in 2017 was 241.9 billion yuan, which...
increased by 20% globally compared with 2016. Meanwhile, the global operating profit increased by 41%, which is the fastest growth of Haier group in recent years. Such achievements of Haier cannot be isolated from the enhancement of Haier's innovation capability.

4. Conclusion and Prospect

4.1. Research Conclusion and Inspiration

Through the longitudinal case study on more than 30-year practice of Haier Group's innovation capability, this study has sorted out the path for the improvement of Haier Group's innovation capability. Haier's innovation capability is a process of dynamic accumulation, the result of the combined action of internal and external factors, and a series of processes of absorbing and internalizing core technology sources. By organizational learning methods such as “learning by doing”, “learning by application”, “learning by research and development”, and “learning by interaction”, Haier can effectively integrate internal and external knowledge and transform it into its core competence, thus promoting the upgrading of Haier's innovation capability.

In the early stage, due to the continuous development of market and technology, the discoordination among market, technology, organization, system and culture was increasingly prominent, Haier's high-level managers timely realized that relying on the single technical ability was impracticable, the technological innovation capability must be transformed from single mode to combinatorial mode, then developing to the total innovation capability of the Internet era. It is a process from quantitative change to qualitative change.

At present, many Chinese enterprises are carrying out transformation, upgrading, and following their own path of innovation. However, the lack of innovation capability is a common situation and it is urgent to improve their innovation capability. It can be seen in the process of the enhancement of Haier’s innovation capability that the synergy of elements is closely related to the improvement of innovation capability, different levels of innovation capability should adapt to different levels of the synergy elements, multi-dimension element combination realizes comprehensive capability and promotes the transformation of capability from non-core to core. As the element participation increases, the innovation capability of enterprise can develop from single to composite capability, which manifests as the development of the technological and market innovation capability toward the combinatorial and total innovation capability. Combinatorial innovation has multiple levels, and enterprises should adopt corresponding forms of combinatorial innovation in different stages of development, so as to give full play to the role of combinatorial innovation capability in promoting the innovation capability of enterprises.

4.2. Theoretical Contribution

First, the independent innovation defined by the existing literature is mainly from the perspective of technological elements, emphasizing the exclusivity of innovation subjects to core technologies in a closed environment. This paper expands the elements involved in independent innovation to multi-factor perspective, and stresses that independent innovation is the innovation in the open environment. In the open environment, the development of enterprises' independent innovation capability can rely on the external forces, but it is necessary to maintain the control of core technical knowledge and ultimately turn it into their own core competence.

Second, the existing researches on the development of the capability focus on the differences of the core technology sources[17], and from the perspective of system theory, this paper points out the improvement path of innovation capability, which is the process from the bottom-order capability in respect of single element to high-order and complex capability in respect of the coordination of multiple elements, breaking through the limitations of previous researches which
only pay attention to the technology elements in the development of innovation capability, and greatly enriching the connotation of enterprises’ innovation capability.

Third, the proposal of total innovation capability has important guiding significance for the construction of enterprises’ innovation capability. Total innovation capability is a broader definition of innovation capability. The total innovation mentioned in this paper emphasizes more on the overall significance of strategic drive, resource allocation, coordination and integration, and emphasizes the importance of holistic and integrated point of view for innovation, which provides the systematic concept and holistic concept with the combination of strategic management, organization design, cultural construction and the industry trend for the enterprises, to help enterprises establish sustainable innovation capability and core competitiveness.

4.3. The Limitation of Research and Prospect

This study strictly follows the methodology of case study, and selects representative enterprises in the field of innovation practice for case analysis. However, due to the limitations of case study itself, there are still deficiencies in this study. The improvement path of innovation capability demonstrated in this study is just one of many paths, but not the only one, there are many enterprises that start from independent innovation and finally achieve success. In addition, the reliability and validity of the theory need to be confirmed by more cases, and the methods of multi-case research and dynamic simulation can be adopted to test and expand the validity of the research conclusion in the future.

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6. References


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