ISCTE Business School
Instituto Universitário de Lisboa

The Strategic Development of Chinese State-owned Enterprises: the Case of a Chemical Company

Deng Weiping

Thesis submitted as partial requirement for the conferral of

Doctor of Management

Supervisor:

Professor Jorge Bertinetti Lengler, ISCTE University Institute of Lisbon

Co-supervisor:

Professor LI Shiming and Professor Ma Yongkai, University of Electronic Science and Technology of China, School of Management and Economics

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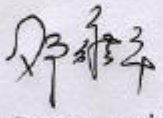
Declaration

I declare that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university and that to the best of my knowledge it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed  Date April 23,2013

Name: Deng weiping

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Deng weiping

Abstract

This thesis, taking Luzhou North Chemical Industry Co., Ltd as the case company for extensive research, identifies key determinants for strategic choice of diversification based on theories including enterprise development strategy, industry value chain and diversification strategy. Then based on the determinants identified, it conducts a detailed analysis on the value creation capability of the case company's SBUs and builds an industry value chain-based diversification framework for state-owned military chemical enterprises. Finally, from two perspectives—natural selection mechanism and learning & adaptation mechanism, the thesis sums up the selection mechanism for industry value chain-based diversification of China's state-owned military chemical enterprises.

Key words: state-owned military chemical enterprise; diversification; industry value chain; value chain; strategic business unit (SBU)

JEL: L11, M11.

Resumo

A presente tese, que tem a empresa Luzhou North Chemical Industry como estudo de caso de investigação, identifica os determinantes chave da escolha estratégica para diversificação com base no quadro teórico que inclui a estratégia de desenvolvimento da empresa, cadeia de valor industrial e estratégia de diversificação. Então, com base nos determinantes identificados, conduz-se à aná lise detalhada da capacidade de criação de valor da unidade estratégica de negócio da empresa analisada e constró i uma cadeia de valor com base na estrutura de diversificação para a empresa pública de produtos químicos. Finalmente, a partir de duas perspectivas- o mecanisco de selecção natural e o mecaniscmo de aprendizado e adaptação, a tese soma ao mecanismo de selecção para a cadiea de valor com base na diversificação de empresas estatais Chinesas do sector químico.

Plavaras-chave: empresas estatais do sector químico, diversificação, cadeia de valor indutrial, cadeia de valor, unidade estratégica de negócio (UEN).

JEL: L11, M11.

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How time flies! I have spent 4 years in the Doctor of Management Program of the UESTC- ISCTE Lisbon University Institute before I knew it. Here I take this opportunity to express my sincere thanks to my teachers and classmates for their care and help during such a period full of beautiful memories.

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I show my thanks to the colleagues of LNCC who have offered me a lot of help in terms of collection of thesis data and confirmation of the research content during the period of thesis discussion, and meanwhile they have shared many of my business burdens when I was focusing on my thesis research, allowing me more time to conduct the research work.

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I want to thank all my classmates and friends who have offered me help and care in both

my study and life. They brought more pleasures to my study and life and made me feel the warmth of the group and friendship.

Due to the limited research ability and restrictions on other things, opinions and study methods in the thesis might not be very mature and complete. You are all sincerely requested to give more valuable opinions. I here dedicate this article to all the people who care about me.

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1.1.1 Competition background

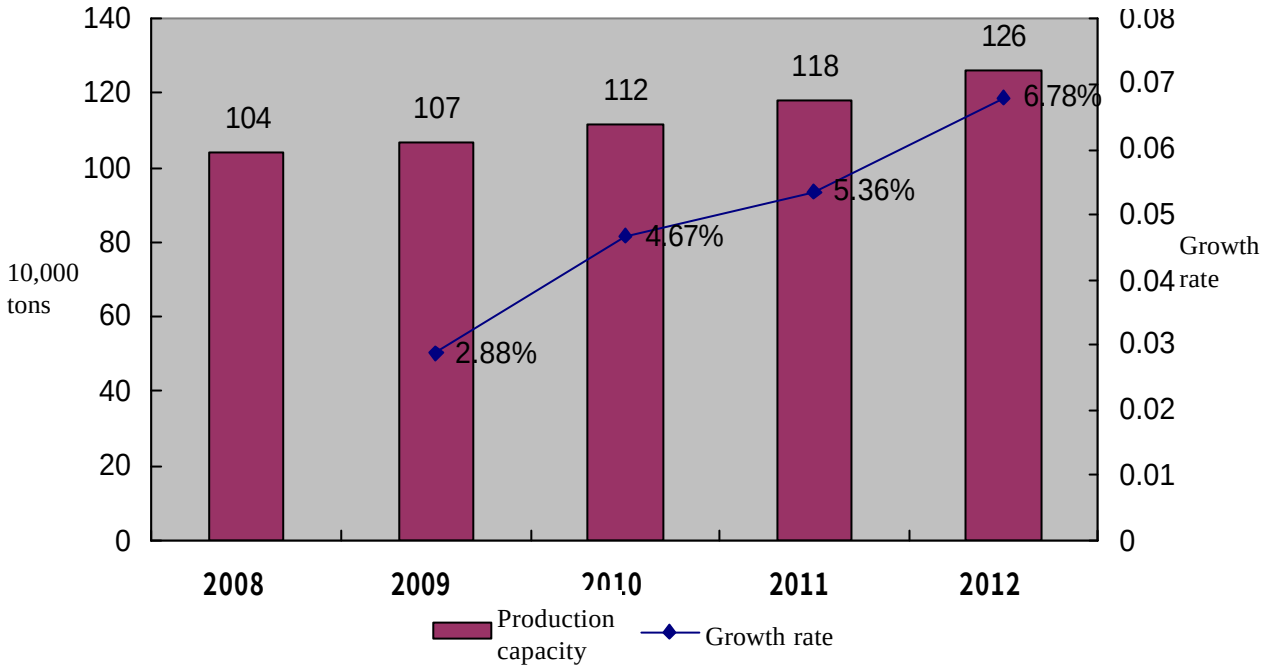
1.1.1.1 Supply of cellulose ether industry

(1) Analysis of production capacity and supply of global cellulose ether industry

In 2009, total production capacity of global cellulose ether industry stood at about 1.07 million tons. As production technology of cellulose ether of developed countries has reached a mature stage and market supply and demand is relatively stable, significant increase in production capacity will not happen. For that demand in relevant industries increases in some emerging economies, production capacity of such countries will increase correspondingly. However, production and processing of high-quality cellulose ethers requires superior equipment process, which limits a substantial increase in production capacity of products. See Figure 1-1 for capacity statistics and forecast of global cellulose ether industry.

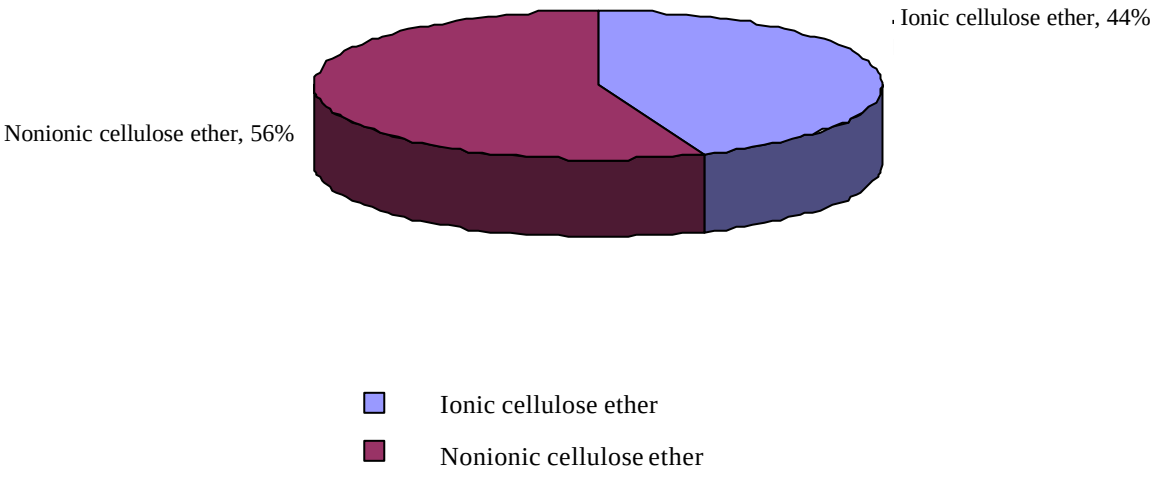
In the cellulose ether industry, cellulose ether products are usually divided into ionic cellulose ether and nonionic cellulose ether. The former mainly includes CMC while the latter primarily includes MC, HEC and EC. Currently, total production capacity of ionic cellulose ether in the world is nearly 470,000 t/a, taking up 44% in total production capacity of cellulose ether industry; while that of nonionic cellulose ether accounts for 56% in total production capacity of cellulose ether industry, shown as Figure 1-2.

Figure 1-1 Production capacity trend of global cellulose ether industry during 2008 and 2012



Data source: Analysis Report of Cellulose Ether Industry in China

Figure 1-2 Capacity structure of global cellulose ether industry



Data source: Analysis Report of Cellulose Ether Industry in China

At present, overcapacity exists in the cellulose ether industry throughout the world. In spite of timely product supply, overcapacity brings serious waste of unused equipment and human resource and increases burden of companies. In terms of quality, overcapacity of

industrial cellulose ether products is outstanding. For fierce market competition, many companies make decision to close outdated plants to increase operation rate of the rest plants or conduct modernization transformation to produce purified-grade products with high added value. In respect to technical content of products, ether products with low technical content like CMC have obvious overcapacity. Thus many companies have upgraded their equipment, so as to improve quality of existing products and occupy high-end market with high added value. Meanwhile, they can also invest more in development of ether products with other high technical contents, so as to extend to other ether markets.

(2)Analysis of production capacity and supply of domestic cellulose ether industry

Since 2004, with increasing domestic demand for cellulose ether products and relevant policies support, cellulose ether industry in China has a rapid development. Number of enterprises above designated size increased to 67 in 2009 from 35 in 2005, shown as Table 1-1.

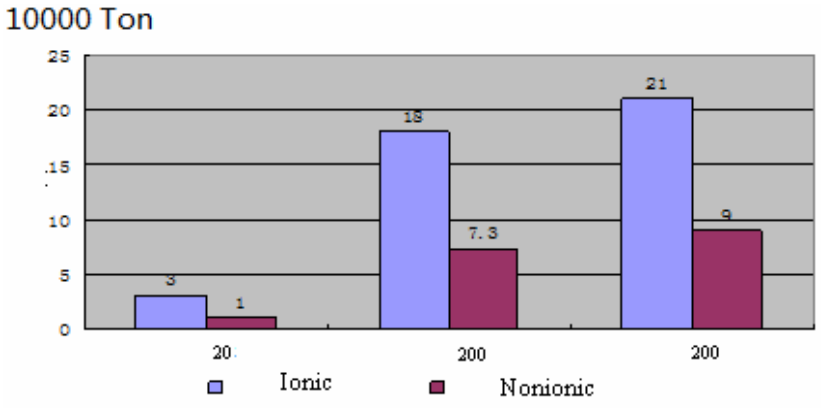
Table 1-1 Number of cellulose ether enterprises above designated size from 2005 to 2009

	2005	2006	2007	2008	2009
Number of enterprises	35	39	46	63	67

Data source: Analysis Report of Cellulose Ether Industry in China

In 2004, production capacity of domestic CMC only stood at 30,000 tons, of which that of nonionic ethers was only 10,000 tons. Up to 2009, production capacity of CMC in China was 210,000 tons and that of nonionic ethers reached 90,000 tons. See Figure 1-3 for changes in production capacity.

Figure 1-3 Production capacity statistics of domestic cellulose ether industry during 2004 and 2009



Data source: Analysis Report of Cellulose Ether Industry in China

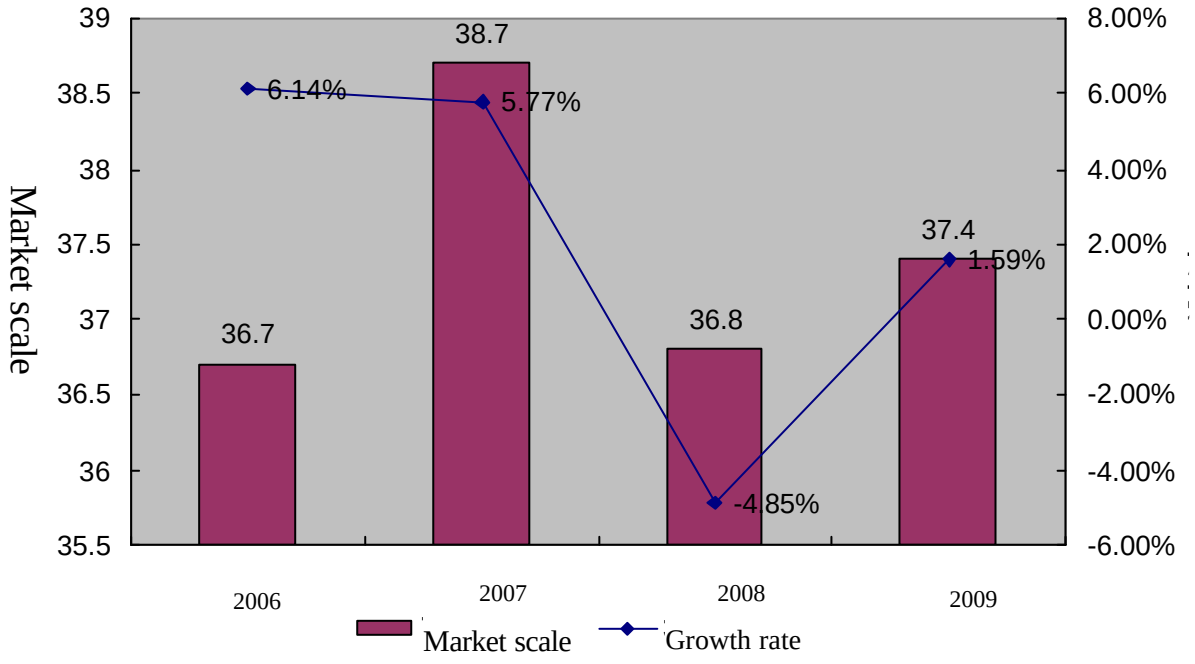
In 2007, production capacity of domestic ionic cellulose stood at 115,000 tons, with an operation rate of 64%; while that of nonionic cellulose ethers was 48,000 tons, with an operation rate of 66%. Till 2009, production capacity of domestic ionic cellulose reached 152,000 tons and that of nonionic cellulose ethers was 71,000 tons, with an operation rate of 79%. According to such figures, we can see a rapidly developing cellulose ether industry in China, with increasing industrial scale, higher operation rate than global average level and a good overall development trend. However, as new production capacity is released continuously, serious overcapacity may happen, which will bring red-hot competition in the industry.

1.1.1.2 Demand of cellulose ether industry

(1) Demand of global cellulose ether industry

See Figure 1-4 for changes in scale of global cellulose ether market from 2006 to 2009.

Figure 1-4 Scale statistics of global cellulose ether market from 2006 to 2009



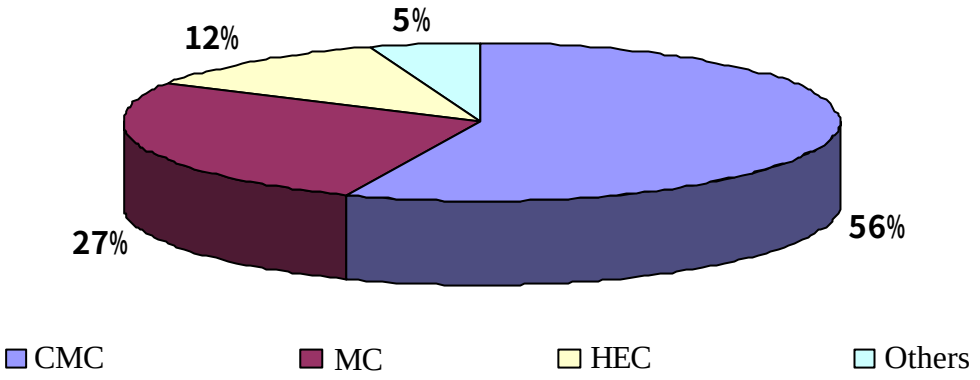
Data source: Analysis Report of Cellulose Ether Industry in China

According to Figure 4-8, market scale of global cellulose ether in 2009 was 3.74 billion US dollars. Impacted by financial crisis, global cellulose ether market scale shrank substantially in 2008, and it failed to go back to the level in 2007. But recovery of many countries from adverse impact of financial tsunami is beneficial for cellulose ether industry.

From perspective of product, ionic cellulose (mainly refers to CMC) is major market

product, taking up 56% in total consumption, followed by MC ether and HEC ether, accounting for 27% and 12% in total consumption respectively. See Figure 1-5 for relevant information.

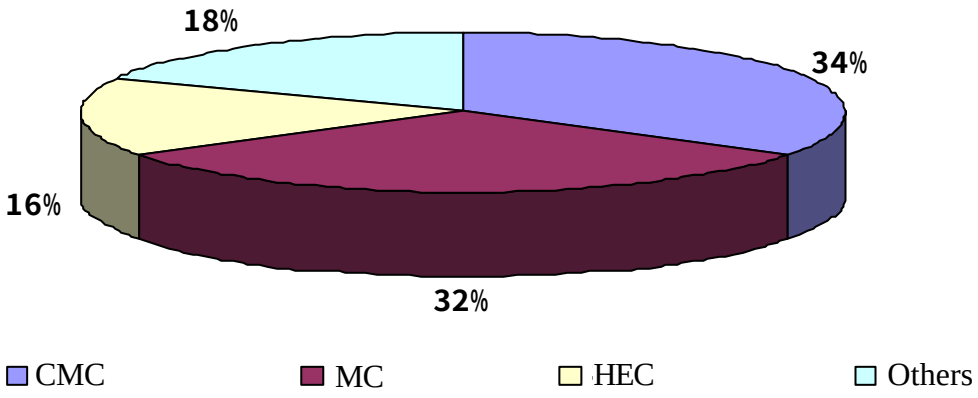
Figure 1-5 Proportion of global major products of cellulose ether by consumption



Data source: Analysis Report of Cellulose Ether Industry in China

However, influenced by production technology and raw material cost, market share of CMC, MC, HEC and other derivatives in the world respectively takes up 34%, 32%, 16% and 18% in terms of consumption amount. See Figure 1-6 for relevant information.

Figure 1-6 Proportion of global major products of cellulose ether by consumption amount



Data source: Analysis Report of Cellulose Ether Industry in China

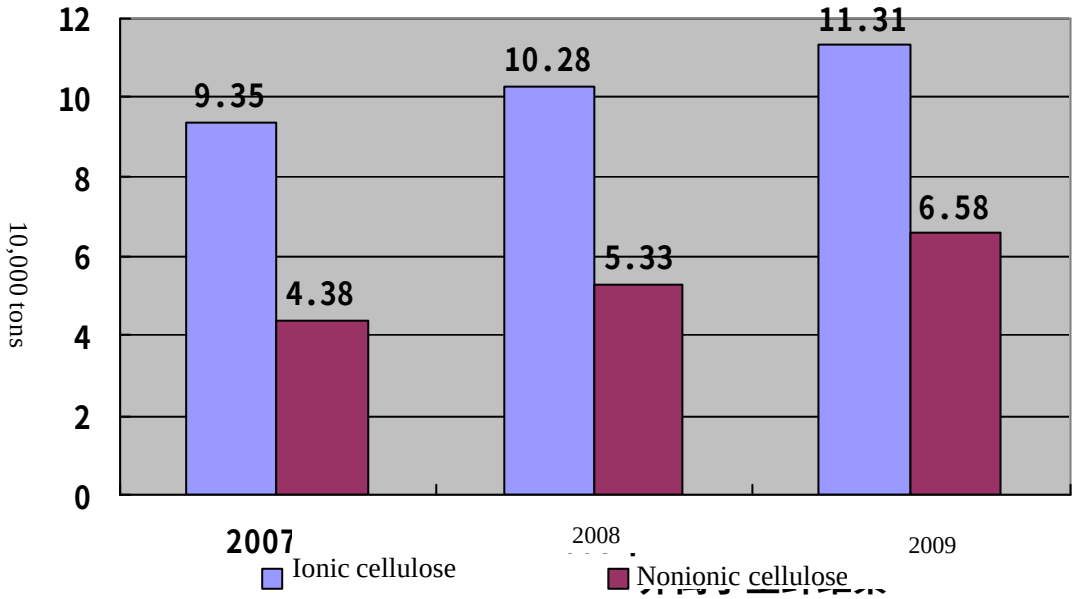
According to comparison between consumption and consumption amount of major cellulose ether products, demand for CMC is huge and price is relatively low. This is resulted from technical difficulty, oversupply and fierce market competition. In case where gap of production cost of various cellulose ether products is not significant, profit margin of CMC

stays low while that of cellulose ether products with high technical contents keeps high.

(2) Demand of domestic cellulose ether industry and market

In 2007, aggregate demand for nonionic cellulose ether in China was 93,500 tons, and that for nonionic cellulose ether was 53,800 tons. In 2009, aggregate demand for nonionic cellulose ether in China was 113,100 tons, and that for nonionic cellulose ether was 65,800 tons. In 2008, during downturn of global cellulose ether industry caused by financial crisis, domestic cellulose ether market had a rapid growth, with an increase of 13.7% in demand compared with 2007. For the last three years, demand of domestic market kept a double-digit increase or above, and together with recovery of global economy, domestic market will have a further expansion. See Figure 1-7 for demand statistics of domestic cellulose ether from 2007 to 2009.

Figure 1-7 Demand statistics of domestic ionic and nonionic cellulose ethers from 2007 to 2009



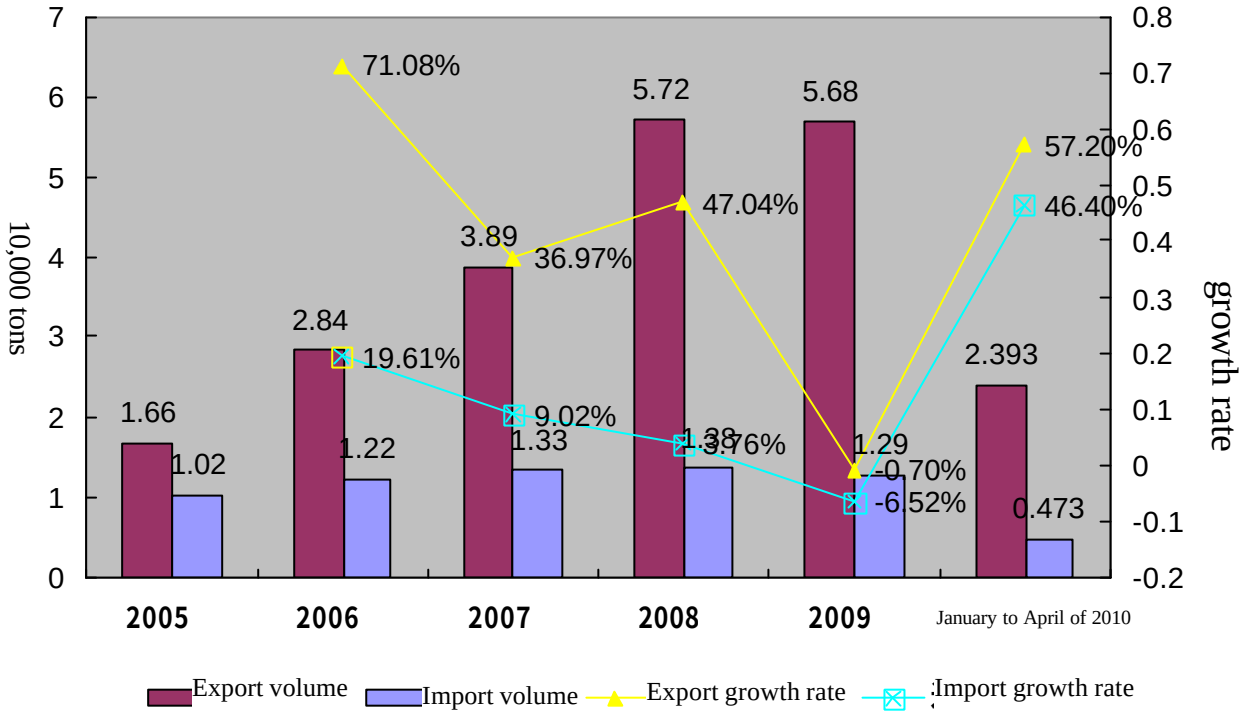
Data source: Analysis Report of Cellulose Ether Industry in China

Cellulose ether produced by domestic enterprise not only supply domestic market, but also to widely serve overseas markets. See Figure 1-8 for foreign trade statistics of cellulose ether from January to April during 2005 and 2010.

According to the above statistics, China is a net exporter of cellulose ethers. Export volume of cellulose ether products increases rapidly. For 2009, net export volume of domestic cellulose ethers stood at 43,900 tons (net export volume = export volume – import volume) and domestic demand reached 178,900 tons, therefore total market demand of domestic cellulose

ether producers was 222,800 tons. In other words, domestic cellulose ether products of 223,000 tons produced in 2009 were almost consumed in the market, presenting a promising outlook.

Figure 1-8 Foreign trade statistics of domestic cellulose ether from January to April during 2005 and 2010



Data source: Analysis Report of Cellulose Ether Industry in China

1.1.1.3 Development trend of cellulose ether industry

Although China is not the largest cellulose ether consumer in the global market, it has a stronger demand growth than any other countries. Under the circumstance that growth of other major global cellulose ether markets slows down and is totally seized by other chemical giants, domestic cellulose ether producers, depending on local advantages, seize favorable opportunities in domestic cellulose ether market. Further expansion of market will bring considerable benefits to the enterprises. Though domestic enterprises are inferior in terms of production technology and product quality compared with foreign producers, they can still continue to make a presence in international market relying on cost price advantage.

But low equipment level of domestic purification technology seriously restrains development of the industry. In the near term, refined ether products of high value added and high-tech ether product market are still under the control of international chemical giants. In the

long run, further expansion of domestic market and adjustment of national industrial policies result in international chemical giants entering into domestic market by means of joint venture and sole investment, which is likely to make them directly partake in domestic competition. Although it is favorable to improve the overall production technology level of the industry, as for single enterprise, there is no doubt that they will contend with intensifying competition pressure. It has become an inevitable issue domestic chemical enterprises have to deal with to well conduct strategic positioning for cellulose ether related products.

1.1.2 Company background

In order to study China's cellulose ether industry, the paper selects Luzhou North Chemical Industry Co., Ltd. (LNCC) as the case company. Then upon in-depth anlaysis on the cellulose ether industry chain of the company, the strategic positioning and development strategy for related key products on this industrial chain are determined, so as to give an insight and reference for strategic choise of Cina's state-owned military chemical enterprises. Subordinate to China North Industries Group Corporation, Luzhou North Chemical Industry Co., Ltd. was initially founded in Gongxian County, Henan Province in 1933, then moved to Luzhou City, Sichuan Province in 1938. The military supplies it produced supported the war of resistance against Japan and the Second World War, making great contribution to the victories of both wars. It became a wholly state-owned military chemical enterprise and renamed as Luzhou Chemical Plant in 1953. It only engaged in production of military chemical products, but began to produce civil products since 1980 under the guidance of state policies. It was reorganized into Luzhou North Chemical Industry Co., Ltd. (hereinafter referred to as LNCC) in 2001, and was reformed and divided in 2004, with research and manufacture of military products solely owned by the state and property right of civilian goods restructured. At present, civil product business of LNCC is based on chlor-alkali industrial chain, centers in cellulose derivative industrial chain, and takes DMC industrial chain as breakthrough, forming a strategic pattern where multi-industrial chains coordinate with each other and develop commonly, pushing the LNCC into the largest cellulose derivative- and DMC-oriented research and production base of cellulose ether products (including chlor-alkali, methane chloride, chlorinated polypropylene.) in China. See Table 1-2 for market analysis of major products of

LNCC.

Table 1-2 Market analysis of major products of LNCC

Name of products	Production capacity in 2010	Market area, supply and competition
Organosilicon (DMC)	30,000 t/a	Primary markets include south, east and southwest of China. Over capacity of domestic single enterprises is serious and price competition is fierce. Production capacity of plants of the company is relatively low, production cost stands at high, and market competitiveness is rather weak.
Carboxymethyl cellulose (CMC)	6,500 t/a	Primary markets include south, east, north and southwest of China. Domestic CMC enterprises have excess capacity and oversupply of products, making market competition fierce. Production capacity of plants of the company is relatively low, production cost stands at high, and market competitiveness is rather weak.
Ethyl cellulose (EC)	240 t/a	Primary markets include south, east, central area and southwest of China. Production capacity of domestic cellulose enterprises can basically balance supply and demand. Production capacity of plants of the company is relatively strong, production cost is lower than that of other domestic companies, and market competitiveness is quite high.
Methylcellulose (MC)	15,300 t/a	Current domestic market capacity is 70,000 tons while international market capacity is 200,000 tons. Nearly 30% of products of the company are sold domestically, and 70% are sold to overseas market, quite competitive.
Hydroxy ethyl cellulose (HEC)	3,000 t/a	Primary markets include south and east of China, as well as Chengdu and Chongqing. Production capacity of HEC of the company makes LNCC a large company in China, having certain advantages compared with domestic hydroxy ethyl companies. Downstream high-end market of domestic

Name of products	Production capacity in 2010	Market area, supply and competition
		hydroxy ethyl is dominated by imported products while hydroxy ethyl products are mainly poured into middle and low-end market.
Caustic soda	130,000 t/a	Primary markets include southwest, south China and Yunnan Province. Over capacity of domestic caustic soda is quite serious. Production capacity of plants of the company is low, less competitive than that of other chlor-alkali companies. However, over the last 2 years, many domestic companies were impacted by policies of power rationing and energy saving & emission reduction, market price of caustic soda remains high.
Methane chloride	11,000 t/a	Primary markets include Sichuan province and Chongqing City. Domestic production capacity of methane chloride can keep balance basically at present. Production capacity of plants of the company is relatively low, with weak competitiveness. But due to huge demand for downstream product of methane chloride - PTFE, prices of methane chloride products kept high in recent years.

Data collection: Data compilation of survey and interview of LNCC.

There are four major products on LNCC's cellulose ether industry chain, including MC, CMC, EC and HEC. In terms of total revenue, as of 2009, the total sales revenue of the four products amounted to 39 million Euros, accounting for 30% of the Company's total revenue; in terms of profit, as of 2009, the four products generated a total profit of 5 million Euros, accounting for 122% of the Company's total profit.(see table1-3) It is obvious that the overall contribution of the cellulose ether industry chain to LNCC is considerable. In terms of investment, LNCC has built a new HRC production line integrating its advantageous resources, and is developing MC through a joint venture with Hercules Incorporated, and has pooled a lot of resources to upgrade CMC production line. However, a comparison of total sales revenue and total profit of the four products from 2006 to 2009 suggests that the growth

of LNCC's cellulose ether industry chain was quite limited. Why? Is it necessary for LNCC to re-evaluate its key products on its cellulose ether industry chain, re-position these products and select a more suitable development strategy? If so, how exactly should it be carried out? Where should we begin? This paper attempts to find an answer for all these questions.

Table 1-3 Sales Revenue and Profits of the 4 cellulose ether products of LNCC

(Unit: 1,000Euro)

		2006	2007	2008	2009
LNCC	Sales	95,835	100,374	116,244	126,925
	Profits	6,288	7,978	3,057	4,278
4 cellulose ether products	Sales	25,105	43,936	51,212	38,689
	Profits	5,678	8,390	8,861	5,202
Ratio(%) (Cellulose/Total)	Sales	26	44	44	30
	Profits	90	105	290	122
MC	Sales	16,788	35,194	38,611	30,608
	Profits	4,879	7,770	7,863	4,624
HEC	Sales	0	0	159	-484
	Profits	0	0	1	-261
EC	Sales	733	922	2,282	1,901
	Profits	47	-198	52	289
CMC	Sales	7,582	7,821	10,161	5,696
	Profits	752	818	945	551

Data collection: Internal data of LNCC.

1.2 Research significance

The chemical industry is an important basic industry of the national economy and plays an important role in economic construction, national defense and people's life. In recent years, due

to technological advances within the industry, government's relaxed controls over chemical enterprises and promotion of market-oriented process, the chemical industry has ushered in a new round of development climax. In 2010, gross output value of the chemical industry amounted to 906 billion Euros, accounting for 22.8% of GDP. During the "Eleventh Five-Year" period, the average annual growth rate of the gross output value of the whole chemical industry reached 21.5%, which had far exceeded the growth rate of the national economy.

At present, China's chemical industry has gradually become an industry that is relatively complete in range and comprises chemical mining, chemical fertilizers, acids, alkalis, inorganic salt, synthetic rubber, synthetic fibers, synthetic resins and plastics, organic materials, pesticides, dyes, paints, photosensitive materials, rubber products, solvents, additives and chemical reagents, and catalysts. However, along with the changes of trading environment and enhancement of environmental awareness, the high pollution chemical products with low technological content and high energy consumption have encountered increasing difficulty to access to the market and make profits.

The state-owned chemical industry is chiefly characterized by complex industry chain, high integrity requirements of the industry chain, high technical requirements of production, and is an industry that depends on knowledge, technology and resource. Its final products are produced with less material and there are a larger number of byproducts. It also has high wastewater and waste gas treatment requirements. From the characteristics of the state-owned chemical industry, it can be seen that the development of such enterprises always starts from a main single product, and it gradually moves toward diversification based on the by-product processing and wastewater and waste gas treatment. Meanwhile, as the state-owned chemical industry is raw material production and processing sector and is in the middle of the whole chemical industry chain, its upstream will be linked to mining and energy industries while its downstream will be linked to chemical fiber, plastic, rubber, medicine, military industry, and food and feed additives industry. Therefore, when observing the development mode of the state-owned chemical enterprises from the perspective of industry chain, it can found that all the current state-owned chemical enterprises achieve their goal of diversified development by optimizing and integrating the industrial chain and extending upward and downward along the

industrial chain.

However, state-owned chemical enterprises in the real world have encountered many problems in implementing the diversification strategy along the industrial chain. First of all, state-owned chemical enterprises often expand their businesses blindly leveraging their advantageous position on the industrial chain without conducting a thorough analysis of key links on the chain. This practice has caused many failed diversifications and great waste of resources. Second, most of China's state-owned chemical enterprises engage in the production of military products, which give them a dual identity of state-owned and military industrial enterprises. Thus their diversification is often contained by government policies. Third, in recent years, China's state-owned chemical enterprises carried out many irrelevant diverse investments in order to consolidate their market position, expand production and increase product varieties. However, diversification not based on enterprise's core competitiveness will not boost enterprise development, instead it will bring heavy burden to enterprises. Therefore, for state-owned chemical enterprises, special care is required when choosing diversification strategy.

In conclusion, state-owned chemical enterprises have an innate appetite for diversification, and due to their advanced technology and relatively stable market demand, they have the actual strength to implement the diversification strategy. But in reality, the characteristics of state-owned chemical enterprises mean that they will be interfered with many internal and external factors in the process of diversification. Therefore, the thesis focuses on approaching the issue of how can state-owned chemical enterprises effectively identify investment potential of each link on the industry value chain, and choose diversification strategy accordingly. The purpose of this research is to provide a perspective for China’s state-owned chemical enterprises, so that they could pursue effective diversification based on appropriate analysis on the industry value chain and finally achieve sustainable development.

From the perspective of theoretical research, due to the constraints of China's special economic system, the development of China's chemical enterprises has long been controlled by the national planning policy (Yan,et.al,2012). Along with the China's economic system reform, the chemical enterprises have also obtained relatively free decision-making rights. Along with

the increasingly refining of the chemical industry chain, it has been found that cooperation and coordination of various enterprises on the chemical industry chain are playing an important role in the development of chemical enterprises. From the enterprise level, if the chemical enterprises have a strong ability to integrate the industry chain, they will certainly have a better development in the chemical industry. Due to this reason, the chemical enterprises have embarked on diversified development one after another so as to obtain the ability to integrate the industry chain.

Diversification has become the issue of common concern for the enterprises when their development has reached a certain stage. The theory of diversification strategy has caused great concern among the theorists and practitioners, which has led to extensive researches and in-depth discussions in the theoretical circle and business world. However, it is not difficult to see that the academic circles have conducted few diversification researches on the chemical industry which has a strong desire for diversified development. In this academic context, many chemical enterprises lack theoretical guidance when choosing diversification strategy, resulting in a failure in the implementation of their diversification strategy. Based on the existing studies, most researches carried out by the scholars have mainly focused on the design and optimization of such issues as production process, environmental protection and recycling economy, as well as on the integration and management of the enterprise's internal capabilities and resources such as technological innovation, logistics, human resources. At the same time, related scholars have also conducted a preliminary discussion on the development strategies and policies for chemical enterprises, but the results of the discussion are limited to the optimization of the enterprise's internal management and process due to lack of understanding of the chemical industry chain. Along with the optimization of the chemical industry chain and improvement of internal management of the chemical enterprises, the guiding significance of these theories on the development of the chemical enterprises has gradually diminished.

As more and more chemical enterprises began to apply the diversified development strategy, a small number of scholars have also conducted studies on the diversification strategy for the chemical enterprises from the perspectives of profitability, diversified direction and diversified management. Generally speaking, the studies on the diversification strategy for the

development of the chemical enterprises are, however, quite superficial and unsystematic, and hence they can hardly provide theoretical guidance on the choice of diversification strategy for chemical enterprises.

To sum up, the lack of studies on the choice of diversification strategy for the chemical industry has caused the lack of theoretical guidance on the diversification strategy for the chemical enterprises. Under such circumstances, chemical enterprises can hardly guarantee that their diversification strategy will be carries out in a scientific manner. Hence, research on the strategic choice of the chemical industry has become rather important and urgent.

1.3 Content and framework of the research

For the purpose of promoting the sound development of enterprises, this thesis mainly studies the choice development strategy of China's state-owned military chemical enterprises. The basic thinking of this thesis is as follows:

First, through collating and summarizing classic theoretical literature on enterprise development strategy, industry value chain and diversification strategy from home and abroad, the subject of research is derived, i.e., how should state-owned military chemical enterprises choose diversification strategy that fits into their industry value chain to better facilitate their development. Second, key factors that affect the strategic choice of state-owned military chemical enterprises are identified based on relevant literature and interviews with case company. Then detailed analysis on strategic business unit (SBU) of the case company is conducted based on the aforementioned key determinants, and industry value chain-focused selection framework of diversification strategy for state-owned military chemical enterprises is formulated on the basis of value creation theory of industry chain.

By the specific structure of the research, the thesis can be divided into five chapters, covering the following specific contents:

Chapter I: Introduction. This chapter mainly serves as an overview the thesis, containing the background and significance of the research, the main content and framework of the research, as well as innovative ideas of the thesis.

Chapter II: Review of relevant researches at home and abroad. This chapter reviews the theoretical researches on classic theories of enterprise development, strategic management, industry value chain and diversification strategy, derives the research subjects of this thesis and serves as theoretical basis for the case study.

Chapter III: Data and Methodology. This chapter gives a detailed introduction to the approaches to collecting and processing the data used in the research, the composition of data, and case study, the main methodology adopted in this thesis.

Chapter IV: the major part for this thesis's research. This chapter covers the following aspects: First, the criteria for the selection of case company and the selection of industry chain for case company are established, which serves as the basis for the selection of appropriate case company and industry chain. Second, a detailed description of the history and resource capability of case company is presented. Third, a detailed analysis on the industrial development of the industry chain to which the selected case company belongs is carried out, and the position and weight of case company in the industry value chain are determined. Fourth, through relevant literature and interviews with case company, major determinants for the strategic choice of case company are sort out; then these major determinants are scored by middle and senior management of case company through weighted precedence chart, identifying three determinants of most significance from various determinants, which are value creation, technology level and market potential, and based on this the research framework of this thesis is formed; Fifth, through analyzing key factors of case company's SBUs, the types of SBUs are determined, laying the foundation for strategic choice; Sixth, on the basis of value creation theory of industry value chain, industry value chain-based strategic choice policy for state-owned military chemicals enterprise taking into account of the three factors (value creation, technology level and market potential) is developed; Seventh, theoretical analysis on the strategic choice of civil products business for state-owned military chemical enterprises is conducted from the perspective of natural selection mechanism and learning and adaptation mechanism, thus theoretical interpretation and theoretical contribution of this research are expounded.

Chapter V: summary of the thesis and research prospects. This chapter summarizes the

main research work, major conclusions and limits of the research, and proceeds to propose perspectives and directions for follow-up research.

1.4 Theoretical and managerial contributions

This thesis focuses on the basic theme of enterprise development, carrying out an in-depth exploration into the industry value chain-based selection policy of diversification strategy for general enterprises and state-owned military chemical enterprises. The major theoretical and managerial contributions of the thesis are as follows:

Developed a strategic positioning model in a three-dimensional business context.

1 Morrow.et,al.(2007) holds that the more unique (higher technical content), more irreplaceable and more inimitable the value creation method is, the higher its value it brings about. Therefore, the quality of any link on the value chain is determined by two major variables, i.e., value content (V) and technical content (T). The thesis, based on in-depth analysis on the case company, found that besides the two most important determinants, market potential (P) is also an important determinants for value creation of links on the value chain. For a certain product, even though its V and T are high, with low P, it would hardly contribute to the overall value creation of the enterprise.

2 The thesis, by means of case study, selects a typical state-owned military chemical enterprise as the subject of research (case company), and conducts a detailed analysis on the case company based on the diversification theory and the theory of industry value chain. Currently, though the research on these two theories is well-developed, studies on China's military industrial enterprises are still few. The study by this thesis can help expand the application scope of these two theories in China.

3 The thesis, based on analysis on key determinants affecting the case company's SBUs, constructs a policy model for industry value chain-based strategic choice factoring in various determinants, providing a good guide for strategic choice of state-owned military chemical enterprises.

4 The thesis also, by summarizing and refining case analysis, theoretically expounds

strategic choice of state-owned military chemical enterprises based on two theories, i.e., natural selection and learning and adaptation mechanism, revealing the incentives and behaviors of China's state-owned military chemical enterprises in choosing diversification strategy.

Chapter 2: Literature Review

This thesis carries out studies on the theme of strategic choice for the development of China's state-owned military chemical enterprises. Thus, by focusing on this theme and combining with the characteristics of China's state-owned military chemical enterprises, this Chapter mainly reviews the enterprise development strategy and enterprise's strategic choice and other relevant theoretical literature, as well as provides theoretical guidance to the main research contents of this thesis by summarizing the documents.

2.1 Enterprise development theory

Enterprise development refers to the process in which an enterprise gradually expands from a small business in the beginning to a bigger one in a later time. The expansion not only embodies the expansion of business scale, but also includes the improvement of business quality and increase of resource allocation efficiency and market competitiveness. As the study of enterprise development changed its focus from the internal development to external development, the enterprise strategy theory gradually became the mainstream theory for studying the enterprise development. Since 1960's, the main theory of enterprise development strategy can generally be classified into three categories in chronological order as follows: strategic planning theory, competitive strategy theory and resource capability theory. A brief overview on these three categories of theory is as follows:

2.1.1 Strategic planning theory

The strategic planning theory suggests that strategy is to plan for the future and the external environment is the main decisive factor for the company to obtain a successful strategy. Andrews (1958) conducted a systematic definition of strategy and proposed a classic SWOT analysis framework, which suggests that the company should match its own strengths with environment opportunities by better allocating their resources so as to form a unique capacity and gain competitive advantage. Ansoff (1957) proposed a strategic product/market matrix

framework. This matrix uses product and market as two variables and carved out strategic alternatives including: market penetration, market development, product development and diversification strategy. This framework is the main framework in the early stage of strategic theory. Later, Chandler (1962) proposed that the enterprise management strategy must adapt to changes of the environment while the formation of the organizational structure have to change in accordance with the changes in the enterprise strategy needs. This is the famous "Structure Follows Strategy" view. Ansoff (1965) further defined the four elements of the strategy, namely product and market scope, growth vector (i.e. direction and trend of enterprise management), synergistic effect (i.e. system integration effect), and competitive advantage.

Generally, the strategic planning theory began to shift its research focus from the internal factors to the external factors of the enterprise at that time. Meanwhile, the strategic planning theory made a series of classic definitions for the enterprise strategy, proposed a series of classic strategic planning paradigms and hence laid a foundation for the development of the strategic management theory. However, this theory did not completely break free of the shackles of traditional management theory. The study on the external environment of the enterprise (especially the study on the industry environment still remained in a very superficial level and was in urgent need of further study.

2.1.2 Competitive strategy theory

The core content of competitive strategy is to seek to establish competitive advantages in a particular industry or market so as to promote a better development of the enterprise among other enterprises in the same industry. Western management scholars have always placed the theory of enterprise competitive strategy in the leading position of corporate research and practice, which has greatly promoted the development and innovation of the enterprise competitive strategy theory. Positioning School led by Michael Porter is the most famous among all schools.

Based on the main idea of the structuralism school led by Mason and Bain, Porter used the analysis framework of "structure-conduct-performance" (SCP) proposed by Scherer (1970) and attempted to apply the related ideas and theories of industrial economics to the field of strategic

management. Porter (1980) believed that the goal of enterprise strategy is to obtain a competitive advantage while the industry attractiveness and enterprise's position in the industry are the sources of the enterprise to obtain the competitive advantage. Therefore, in the process of developing the strategy, the enterprise shall first analyze the industry market structure and choose to enter the industry sector that is attractive and has a high-profit potential, then analyze the relative competitive position of the chosen industry, and finally conduct the enterprise's strategic positioning. Based on the logic developed by this strategy, Porter (1980) further proposed the tool for analyzing the industry market structure, i.e. the famous "Porter's Five Forces Model". Porter believes that the competition in the industry is mainly reflected in the five competitive forces, namely the threat of new entrants, threat of substitutes, buyer's bargaining power, seller's bargaining power, and competition between competitors. Interaction of these five forces ultimately affects the overall profit of the industry. In short, the main idea of Porter's "Five Forces Model" is that the industry structure leads to a strategy to be used by the enterprise and this strategy will shape the path of enterprise development. This means the enterprise development is subject to the industry environment (industrial organization environment). Therefore, the enterprise must clearly understand these constraints and take the appropriate position so as to develop.

Based on the analysis of industry market structure, Porter further explored how the enterprise can obtain higher profits than their competitors in the chosen industry. Porter (1985) provided three strategic choices based on the characteristics of different markets: (1) cost leadership strategy; (2) differentiation strategy; (3) focus strategy. Although these three strategies have different emphases in terms of form, they in essence all enable the enterprise to establish and expand competitive advantages in the industry market.

Porter's positioning theory successfully applied the idea of industrial economics to the strategic management field. It also successfully turned the strategic analysis from the internal perspective of the enterprise to the industry perspective and hence promoted the strategic management theory to enter a stage of unprecedented prosperity. Meanwhile, the order developed by the strategy put forward by the positioning theory and the tools for analyzing the industry structure also provided an important reference to the enterprise strategy development.

However, the positioning school has some limitations. For example, it puts excessive focus on the impacts of the industry structure and competition in the industry on corporate performance and neglects the constraints on the enterprise's own resources and capacity so that the strategy developed by the enterprise is too radical to control.

On the basis of the Resources Based View developed by Wernerfelt (1984), Barney (1986, 1991) puts forward that resource that can bring an enterprise excess profits is the strategic resource of the enterprise, and he further sums up features of strategic resources as rare, valuable, inimitable and non-substitutable. This view, though well explains the source of enterprise competitiveness, focuses the perspective of enterprise strategy study on the internal aspect of an enterprise. The thesis is in the opinion that, as the inter-enterprise relationship becomes increasingly closer and the competition between them becomes fiercer, an enterprise must well manage both its internal and external environment if it wants to gain sustained competitiveness. Barney (1991) provides inspiration for the study of the thesis, which holds that when choosing diversification strategy, enterprises not only have to consider their internal resource advantages, but also need to evaluate the value of external strategic resources. Therefore, the study of diversification strategy selection of the thesis will, based on the industry value chain, focus on studying the value creation of key links on the industry value chain, and finally enterprises' choice of diversification strategy through combining the enterprise's internal capability and value creation of external links.

2.2 Theories regarding industry value chain

2.2.1 Value chain theory

As information technology developed in leaps and bounds in 1980', digital economy and e-commerce fuelled by the Internet have ushered in the era of knowledge economy. Information asymmetries have been reduced more than ever before, and productivity is higher than ever before, which substantially lower the cost of enterprises and promote enormous progress of society's productivity. This trend has brought changes to the playing field of enterprises and competition rules between enterprises. Also, the profit margin of the manufacturing industry

has been diminishing, while that of the knowledge-intensive service sector has been incrementing; profit for hardware products becomes increasingly thinner, while the profit of software products, especially system software products has become increasingly lucrative. The huge change pressures enterprises to lower costs, adjust organizational hierarchy, innovate on design process and draw up a new development strategy.

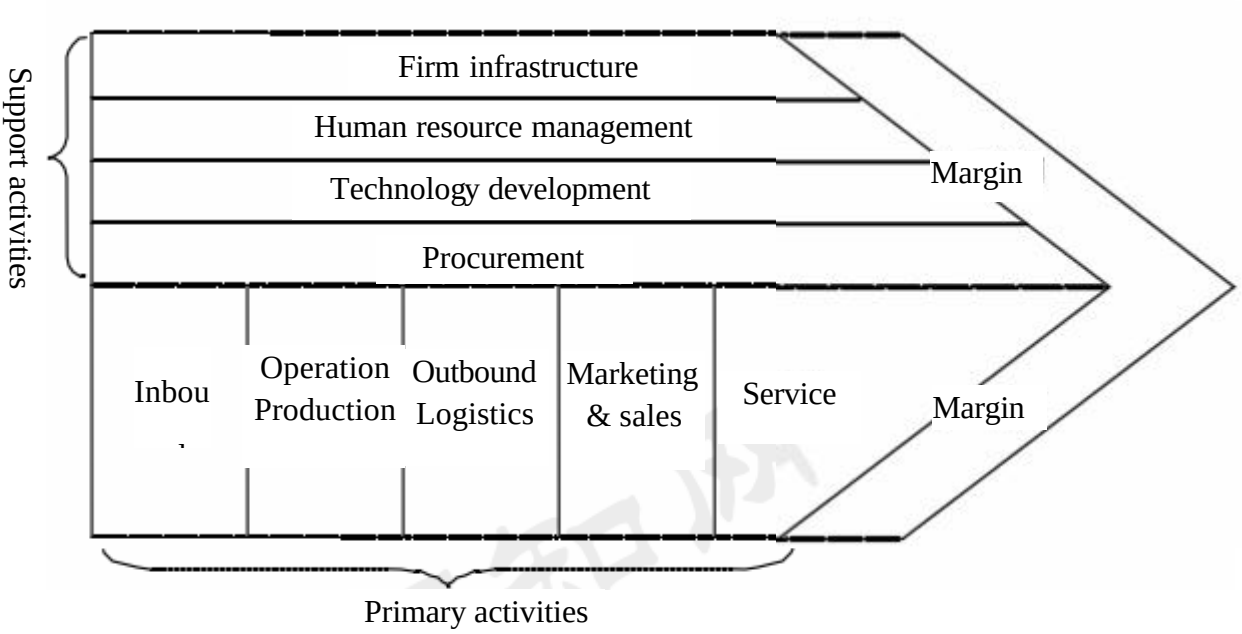
In 1980, in his newly published book Competitive Strategy, Michael E. Porter treated the competition dynamic within industry, namely the interplay of five primary competitive forces – "threat of new entrants, threat of substitute products, bargaining power of customers, bargaining power of suppliers and existing competitive rivalry", put forward three alternative competitive strategies, namely "cost leadership strategy, differentiation strategy and market segmentation (focus) strategy". Porter also published his theoretical analysis model regarding competitive rivalries, which explored how to identify rivalries and how to grasp and interpret market signal of competitive rivalry's move. This theory of Porter has its limits due to its lack in touching upon the strengths and weaknesses within an organization and the relations between competitive forces.

During this period, Porter found that many enterprises blindly ventured into highly-profitable industries that they lacked experience or irrelevant to their own advantages in pursuit of handsome profits, and failed on irrelevant diversification. In light of this, Porter published his book Competitive Advantage in 1985. This book proposed an important concept—value chain, which set up a framework for systematically identifying and analyzing competitive advantages of enterprises, and refined his competitive theory (see Figure 2-1).

In Porter's opinion, "each enterprise is the aggregation of various activities performed in the process of designing, producing, distributing, delivering and supporting its products, and all these activities can be reflected by a value chain." The value creation of enterprises is realized through a series of activities that can be roughly divided into primary activities and support activities. Primary activities include inbound logistics, operations (production), outbound logistics, marketing and sales, and service; while support activities include procurement, technology development, human resource management and firm infrastructure. All these different yet interconnected production and management activities constitute a dynamic value

creation process—value chain (Porter, 1985):

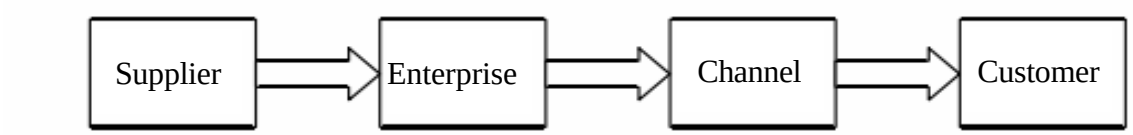
Figure 2-1 Generic value chain by Porter



From the initial point view based on the manufacturing industry, value chain is perceived as a series of activities completed in order, a process that convert the raw materials into finished products. Thus, Porter's value chain is generally seen as a concept in a traditional sense that focuses on analyzing value-adding activities of enterprises and possible connections between enterprises, suppliers and customers, and then proceeds to analyzing competitive advantages from the perspective of individual enterprise. One major contribution of Porter's value theory is that it breaks down the value creation process of enterprises into a series of value-adding activities and treats these value-adding activities separately.

Porter also pointed out that enterprise value chain is just a part of a whole value system (see Figure 2-2).

Figure 2-2 Value system by Porter



The value system by Porter (Porter, 1985) is a larger value-adding system encompassing production enterprises, upstream suppliers, downstream distributors and customers. Supplier

value chain creates and delivers inputs and what enterprise value chain procures; it is through channel value chain that products are distributed to customers; and products produced by enterprises will ultimately become part of customer value chain. All these value chains will act to influence enterprise value chain, which puts enterprise value chain in a broader value system. From this perspective (Jia 2005), value system is comprised of supplier value chain, enterprise value chain, channel value chain and customer value chain. Supply chain is a sub-system of enterprise value chain, manufacturers and suppliers constantly communicate with each other on information regarding raw material demand, production, planning and inventory through this sub-system (McGuffog, 1999).

In short, value system is the aggregation of value chains within and beyond an enterprise, and value system is open in nature. Enterprise value chain is reflected in a wider range of activities of the value system (Feng, 2002). In light of this, to acquire and maintain competitive advantages, an enterprise needs not only to understand its own value chain, but also understand the value system which the enterprise value chain is part of.

2.2.2 Supply chain theory

In 1982, the concept of supply chain was first described by management consultants Booz and Hamilton (Wang, 2007). Later, the academic circle developed a relatively complete supply chain theory based on the concept of value chain proposed by Porter. Supply chain (SC) is an enterprise network that involves flows of goods, information and capital and encompassing suppliers of raw materials and components, manufacturers, wholesalers, retailers, transport operators and end customers. Raw materials and components are moved through every enterprise along the “chain” in order, turned into semi-finished products and finished products, and then moved through a series of distribution links before finally sent to the customers. These activities constitute all the activities of a complete supply chain. In short, supply chain is an integrated industrial system that covers upstream and downstream enterprises of all links involved in moving products or services to end customers.

There exist flows of materials, information and capital within an enterprise, which is the basis of Porter’s concept of enterprise value chain; also, there are same flows between

enterprises, which give rise to the concept of supply chain. Supply chain, in fact, is the external value chain of an enterprise, which puts more emphasis on how to strengthen inter-link and inter-chain connections through technical means so touted by IT operators that the concept of "supply chain management" has .got divorced from its strategic implications to put more stress on realize integrated operation through information technology (Johnson, 2006)

Summing up, supply chain can be defined as a functional chain-network structure centered on core enterprises and that, by controlling the flows of information, materials, goods and capital, connects and integrates suppliers, manufacturers, distributers, retailers and end users, spanning from the procurement of raw materials, manufacturing of intermediate products and final products, to delivery of products to customers by distribution networks. Compared with value chain theory, supply chain is a structure model of enterprise value chain in a broader sense, encompassing all associated node enterprises. This theory gives more emphasis on enterprises' efforts in forging core competencies and forming a "win-win" cooperation model of supply chains between enterprises through outsourcing, establishing strategic cooperation relationship with other enterprises. As with Porter's enterprise value chain, it focuses on value creation, but sees beyond the limitations of Porter's enterprise value chain to extend its perspective beyond enterprises, opening an enormous space for future research of industrial chain and global value chain. The connection between industrial chains boils down to the connections of enterprises within industries since an industry is the collection of enterprises, thus there is an inherent and close link between supply chain and industrial chain.

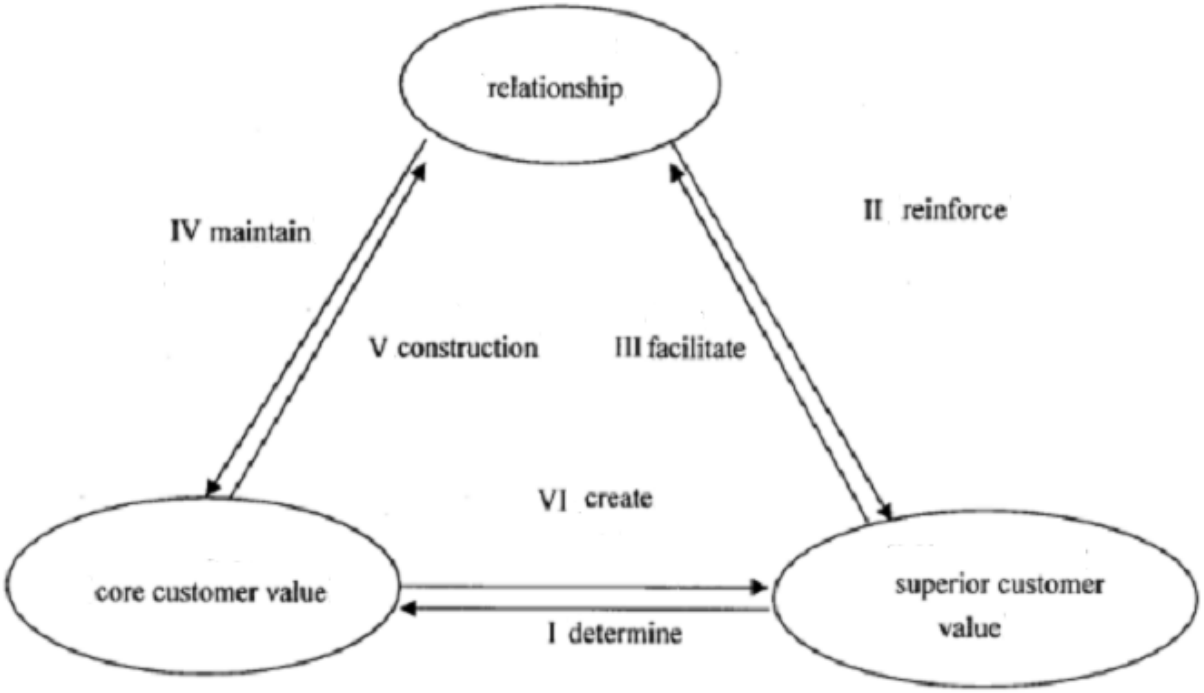
2.2.3 Value network theory

When information technology and other scientific technologies developed rapidly, global economy became more integrated, market demand changed increasingly and competition became fiercer, the development and survival of enterprise became more dependent on its capability to innovate and adapt to external environment, as well as the capability to cooperate. Traditional ideas of value chain were faced with a series of new challenges (Chi, 2003). Consequently, the concept of value network arose in the management circle, and was studied by many scholars.

In 1998, the concept of value network was first put forward by renowned consultants Slywotzky, et.al. (1998) of Mercer Management Consulting. In their opinions, faced with increasing demand of customers, the shock of Internet and a highly competitive market, enterprises should transform the traditional value chain into value network. However, Bovet (2000) argued value network is a new business model. In order to fulfill such tasks as provide goods or services to the market, multiple enterprises are connected in a network through information technology and formed a cooperative organization for the purpose of providing goods and services for the market in a more effective and efficient way, and performing market functions that can't be accomplished by single enterprises. Value network not only enables each enterprise to maintain its own strengths, but also to an extent expand the scope of resources utilization, enabling each enterprise to share other resources provided by the alliance at a lower cost. Many professionals within the circle, including the author of *Value Networks*, believed that the significance of value network lies in its role in integrating traditional supply chains. Currently, there has not formed a uniform definition of value work. People like Lambert, et. al. (2001), Chang, et. al. (2002) perceived value network as a customer-centered value creation system that combines strategic thinking and improved supply chain management, replaces the traditional supply chain model to better meet customers' need for convenience, response, reliability and custom service. While Andrews (1998) regarded value network as the embodiment of enterprises that can be represented by network model, in which separate customers are connected by media technology.

A model of value network developed by Prabakar Kathandaraman and David T. Wilson is shown in Figure 2-3. This model was built upon three core concepts of value creation, namely superior customer value, core competency and relationship, explicitly embodying the complex interplay and systemic links between the three core concepts.

Figure 2-3 Value network model



The research work regarding value network at home is at its inception. Li (2001) perceived value network as a value creation, allocation, transfer and utilization relationship and structure formed by the interplay between stakeholders. Wu (2004) thought that value network is, in its essence, a system in which certain enterprises with patent assets and relevant stakeholders that are at different nodes and remains relatively unchanged group themselves together through certain value delivery mechanism, under corresponding governance framework and a specialized production and service model. Inseparability or complementarity combines these enterprises that co-create the value together. Chi (2003) considered value network as network organization formed through integrating core competencies along the value chain. Value network is a customer-centered value creation system comprised of enterprises with complementary advantages, connected by information technology and e-commerce infrastructure, cooperating with each other to create greater value.

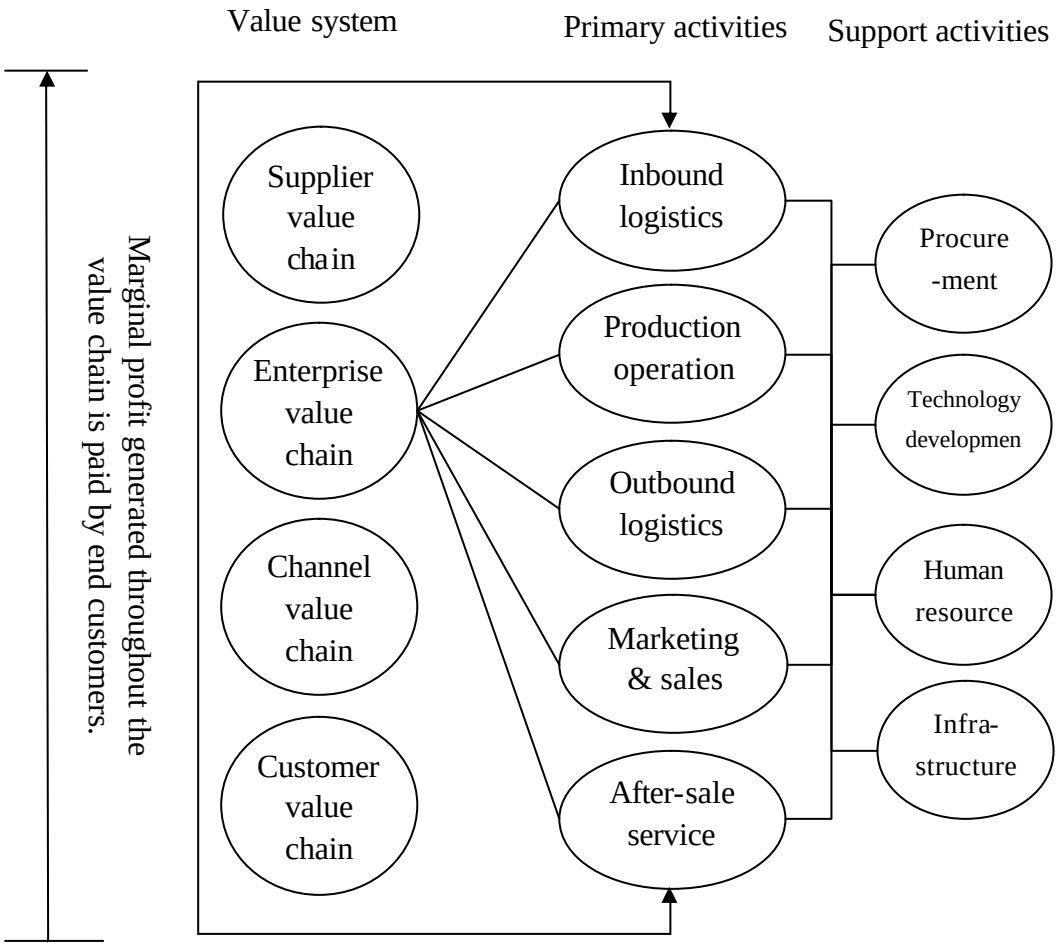
Although the theory of value network is immature, the major contribution of the theory is that it realized that traditional value chain was unable to facilitate the development of uniform infrastructure that creates value for customers by its members with the today's desired speed, and it stressed that the network connects customers is fundamental to creating value for

customers.

2.2.4 Industry value chain theory

Modern enterprise can be perceived as a collection of a series of orderly operations established to satisfy the needs of customers. There actually forms a operation chain among these operations starting from supplier, going through enterprises and finally moving the products to customers. Meanwhile, with the creation of value and consumption of costs, these operations form a value chain. The enterprise value chain then interacts with supplier value chain through procurement, even reaching to the supplier of raw materials; at the same time, enterprise value chain interacts with customer value chain through sales and after-sale service to end users. All these connections constitute a industry value chain (as shown in Figure 2-4).

Figure 2-4 Industry value chain



Hou (1998) perceived industrial chain as the flow of goods spanning from suppliers,

through manufacturers or distributors to end customers. Stevens (1989) considered industrial chain as a system connecting suppliers, manufacturers, distributors and customers, along the chain there are feedbacks of flows of goods and information. This view not only regards industrial chain as a product chain, but also a information chain and function chain, emphasizing both information and products, recognizing the exist of a feedback process within the industrial chain. Harrison (1993), based on the concept of value network, defined industrial chain as a functional network that procures raw materials, converts them into intermediate products and finished products, and sells these products to end users.

As China's economy steadily grew, some domestic scholars began some preliminary research into industrial chain and developed several definitions. Yang and Xia (1999) defined industrial chain (or industrial activity chain) as value chain consisting of sequential value-adding activities within an industry or among industries. Industrial chain can encompass several product chains or service chains. Chen Bo (1999) defined industrial chain as chain relations among industries formed through the provision and procurement of production elements. Jiang Junguo put forward that “industrial chain refers to a strategic alliance chain formed among enterprises with strong international competence (or potential international competence) within an industry and other enterprises in related industries in s specific cluster.” He also expounded the historical logic and theoretical basis of industrial chain in detail, and explored the stabilizer of industrial chain. Lin Shen et. al. (2001), from the perspective of resource allocation, analyzed the “supply-demand” relation of integrated resource management during the process of commercializing scientific and technological achievements, and pointed out the underlying cause of poor commercialization is the structural imbalance between technology chain, industrial chain and technology innovation chain. Yin and Xiao (2002) developed the original concept of eco-industrial chain and generic methods to establish it. On this basis, Du (2005) developed a relatively accurate definition of industrial chain: "Industrial chain is the collection of economic activities that are sequentially connected, horizontally extending and orderly, and that involves the provision of raw materials and marketing and sales to meet the demand of an array of certain interconnected products or services". In his doctoral dissertation and subsequently published book, Liu (2006) defined industrial chain as “a

sequentially related, dynamic, chain-like intermediate organization formed on the basis of certain logical relation and temporal and spatial layout among enterprises within an industry or in different industries that is product targeted, linked through input and output and value creation-oriented seeking to meet customer demand".

Another way to put industrial chain is industry value chain. Pan (2001) considered industry value chain as the collection of sequentially interconnected enterprises that based on a core technology or process to provide a utility system that can meet certain needs of customers. Many articles at home do not strictly differentiate industrial chain from industry value chain, in fact, as the resources moving constantly through industrial layers along the industrial chain, the industry value is bound to increase. To a certain extent, industry value chain is the value embodiment of industrial chain, and industrial chain in turn is the product embodiment of industry value chain.

In conclusion, this thesis defines industrial chain as a vertical relation chain with its value increasingly added that keeps one or several resources moving through different layers of industry to downstream industries and on to customers. It has three implications: (l) industrial chain is the embodiment of layers of industry and their connections; (2) industrial chain is a process that transforms resources into products through deep processing to ultimately realize value increment; (3) the ultimate goal of industrial chain is to meet the demand of customers. It can be implied from the above definition, that there are obvious difference between industrial chain and supply chain. Supply chain, focusing on core enterprises and with an economic, balanced and consistent perspective, exploring how to realize smooth flows of goods, is typical of "horizontal integration" management thinking. While industrial chain is a comprehensive concept developed upon supply chain, from the perspective of industry (line of business), it not only studies flows of value, goods, and information, but also studies the process of value creation, analyzes the interplay between these flows and designs suitable structure and relationship. Industrial chain pays more attention to the agility and flexibility of organizations, ensuring the smoothness and improvement of material, information and capital flows along the "chain" through designing organizational structure, thus is a vertical and orderly collocation. In fact, the development of supply chain theories serves as important driver facilitating the

formation and development of industrial chain theory. When it comes to management, methods and techniques used in supply chain are often applied, and basic concepts, ideas and principles of supply chain used as reference.

2.3 Theory of enterprise diversification strategy

The subject of this thesis is state-owned military chemical enterprises. Firstly, these enterprises is in the middle of the industrial chain, hence, they have a strong desire for diversification development. Secondly, advanced technology and great market demands of these enterprises have ensured good profitability. They are therefore well-positioned for diversification development. However, currently, failures of implementation of diversification strategy in state-owned military chemical enterprises can be found everywhere. Consequently, this thesis is aimed to discussing choice of diversification strategy of state-owned military chemical enterprises. This section will also tease apart relevant literature of diversification strategy of enterprises.

2.3.1 Definition of enterprise diversification strategy

The first person to notice and study enterprise diversification strategy is strategy master Ansoff. Ansoff (1957) defines diversification operation of enterprises explicitly from the perspective of enterprise growth strategy, i.e. diversification is an action of growth or expansion taken by an enterprise when it has developed to certain degree for long-term development. He also thinks that there are generally four directions for enterprise growth: (1) increasing in already owned market; (2) selling new products in already owned market; (3) selling existing products on new market; and (4) selling new products on new market. The (4) direction belongs to diversification strategy. Ansoff (1965) further discusses types of enterprise diversification to perfect the definition of diversification operation, including (1) horizontal diversification; (2) vertical diversification; (3) concentric circle diversification; and (4) hybrid diversification. However, it is not faithful to define diversification of enterprises just based on the number of types of products. Highly related multi-products operation and highly unrelated multi-products operation are substantially at different diversification level even if their number of types of

products is the same.

Based on Ansoff's concept of diversification, Penrose (1959) further defines diversification: diversification of an enterprise means without dropping the existing product lines, the enterprise produces new products, including intermediate products, which differ a lot from the previously existing products in production, marketing and other aspects. Thus, diversification includes increase of end products of each type, vertical integration degree and the number of production fields operated by the enterprise. Being more close to the essence of enterprise diversification, Penrose's definition makes up Ansoff's definition of diversification. However, from the perspective of enterprise growth, she confuses vertical integration with diversification in her definition, and views vertical integration as one form of enterprise diversification, which obviously has enlarged the connotation of enterprise diversification.

Gort (1962) defines enterprise diversification more precisely as increase of the number of heterogeneous market where a single enterprise carries out activity. It is not diversification if heterogeneity of production activity only involves like products with some difference or vertical combination method. Gort indicates diversification level by increase of the number of heterogeneous market. This definition includes both diversification of products and diversification of market, thus greatly enlarging the definition of diversification. Nonetheless, Gort has not included all diversification activities in his definition, such as diversification by merger.

Rumelt (1974) holds that there is no definition or measurement of diversification that can be accepted universally. He defines diversification as (1) the quality of diversification that enterprises themselves have; (2) strategy manifested itself by integrating finite power, skills or targets with new activity mode related to previous activity mode. Rumel's definition of diversification is instructional and there is no concrete description of the meaning of diversification.

To sum up, diversification strategy is major theme of growth strategy of an enterprise and one of the major methods for enterprise growth. Essential characteristic of diversification strategy is enterprises seeking optimum combination of enterprise capability and market opportunity on the basis of their weighing of enterprise capability, enterprise risks and

enterprise profits. It discriminates whether an enterprise develops by mainly operating one industry with some other auxiliary industries, or by lay equal stress on several industries; whether an enterprise develops in related business fields, or by expanding totally unrelated or related business fields.

2.3.2 Theory on choice of enterprise diversification strategy

(1) Theory on choice of diversification strategy based on resources and capabilities

Enterprises should first consider whether their resources and capabilities support their diversification before they implement diversification strategy. Resources and capabilities can be deemed as basis for enterprises to choose diversification strategy.

Resource school has studied choice of diversification strategy based on strategic resources owned by enterprises. Wernerfelt (1984) uses resources / products matrix tools to examine combination effect of resources exclusively owned among different products and their effect on enterprise value. Grant (1991) puts forward steps of diversification development strategy formulation mainly from the perspective of resources. In his opinion, at least the following five steps are necessary for enterprises to formulate diversification development strategy: firstly, determine and evaluate tangible resources and intangible resources of enterprises. Secondly, determine and evaluate capability of enterprises, among which capability to integrate different departments may be the most important. Thirdly, evaluate durability of profitability of enterprises' resources (capability).Fourthly, evaluate ownability of proceeds. Fifthly, formulate diversification development strategy. That is to say, formulation of diversification development strategy is aimed at protecting and using these resources (capability) effectively, demarcating core competition fields, sustainably cultivating and developing unique resources (capability), thus improving value of enterprises.

Meanwhile, capability school has studied choice of diversification strategy based on core capability. Prahalad and Hamel (1990) think that only enterprises with core competitiveness can produce core products with unique competitive advantage, and therefore realize development of business unit. Teece (1997) puts forward that enterprises should review and reposition their resources and modify, integrate and update their capability as necessary to

guarantee formulation of proper diversification development strategy, thus maintaining or obtaining long-term competitive advantage to adapt to uncertain market change. Erickson and Miclson(1998) think that procedure of diversification development strategy based on core capability can be divided into the following aspects: (1) identify core capability, including enterprises' specificity assets, organizational standards, and knowledge; (2) identify fields where core capability can be given full play to; (3) design proper organizing structure to guarantee use, protection and further development of core capability; and (4) formulate proper diversification development strategy.

Ideas of choice of diversification strategy of resources theory and capability theory are mostly the same, such as their recognition of resources (or capability)'s characteristics of being valuable, rare, inimitable, and non-substitutable. and its importance for diversification strategy activity to identify and exploit these resources (or capability).However, resources and capabilities has extensive connotation and complexly related internal element, which makes it difficult to measure, thus lacking operability in practice. Furthermore, theory on choice of diversification strategy based on resources and capabilities has neglect analysis of external environment, which may easily lead to deviation on choice of diversification strategy.

(2) Theory on choice of diversification strategy based on industry organization

When making choice of diversification strategy, development characteristics of industry which the enterprise belongs to and position of the enterprise in the industry should be paid close attention to as well as resources and capabilities owned by the enterprise. Theory on choice of diversification strategy based on industry organization is mainly based on theory of position school whose representative is Porter. Xu (1999) believes that scientific and rational diversification management strategy should maintain high relevancy among industries; Rui (1995) puts forward modification model for diversification development, i.e. finite related diversification strategy under support of core specialty and core industry; Gu also thinks that direction of diversification management should be determined on the basis of relevancy between existing strategic assets and new industry to enter; Compbell (1995) also carries out study on business choice for diversification strategy based on adaptability of characteristics of diversification enterprises and business opportunities and key success factors, on the basis of

which he classifies the following 5 business types: core business, peripheral business, ballast business, value trap business and business of different cluster, among which, core business suits for diversification, while business of different cluster should be avoid.

In conclusion, mainly based on analysis of characteristics of existing businesses in the industry, theory on choice of diversification strategy based on industry organization determines relevancy between existing businesses and new businesses and decides whether to choose diversification strategy or not. However, it is obvious that theory on choice of diversification strategy based on industry organization has neglect resources and capabilities within the enterprise, in case of high relevancy between existing businesses and new businesses, still, diversification strategy will probably end with failure without corresponding resources and capabilities within the enterprise. Therefore, it is apparent that only analysis of industry environment can hardly meet requirements of choice of diversification strategy.

(3) Theory on choice of diversification strategy based on value chain

Porter is the first to come up with the concept of value chain. Porter (1985) regards value chain as a series of value activities of an enterprise to turn raw materials to end products, among which internal logistics, productive operation, external logistics, market and marketing and service are basic value activities, while purchase, technological development, management of human resources, and infrastructure of enterprise are auxiliary value activities, and these two value procedures supplement each other, constituting the dynamic procedure of value creativity for the enterprise. Whereas, Porter's theory of value chain is focused on value activity within single enterprise and aims value chain at profit directly, which overlooked value demands of stakeholders on the value chain. With a series of development, Waiters and Lancaster (2000) have come up with a more extensive definition for value chain, which takes value chain as a business value system which creates user value and meets demands of stakeholders on the chain.

Subject to the above definition of value chain, it is generally acknowledged that there are tangible relevancy and intangible relevancy among related businesses of enterprises. For tangible relevancy, value activities among related businesses can be shared due to common customers, marketing channels, production, technique, credit, talents and financial structure,

including market relevancy, production relevancy and technique relevancy. Intangible relevancy is based on sharing of operational ability or brand, and reputation. among different value chains. Porter (1985) believes that it is easier for diversification based on tangible relevancy to succeed than diversification based on intangible relevancy. With study and research deepening, currently there have been relevant scholars who regard theory on choice of diversification strategy based on value chain as the bridge connecting resource- and capability-based theory and industry organization theory. Chen (2005) main value activities on value chain of enterprises lead to competitive advantages of enterprises; core capability of an enterprise can be found by analysis of industry value chain; and if the enterprise also has new businesses with good performance, it can achieve diversification successfully.

All in all, the core of choice of diversification strategy is to make the most of resources and capabilities of the enterprise, identify new businesses in industry organization which are highly related with the enterprises and make value chain tools as a bridge to choose the diversification business portfolio which suits the enterprise best. Nonetheless, relevancy is not the sole criterion that determines enterprise diversification. Success of diversification is also subject to a number of other conditions, such as macro market demand, size of enterprise, and development stage of enterprise.

2.3.3 The benefits and limitations of diversification

Enterprises diversify their business primarily in pursuit of potential benefits, so as to facilitate the development and growth of the enterprise. Many experts and scholars have studied the benefits of diversification for enterprises, which can be summed up as the following aspects:

(1) Economies of scope. For a company operating in multiple industries or product markets, “economies of scale can reduce costs, and it is achieved through transferring the capability and competency from one existing business to another new business” (Porter, 1985). Essentially, economies of scope means that an enterprise’s multiple lines of business can share its various resources, especially making full use of its residual resources, including both tangible resources (production capacity, marketing, distribution & service network,

technological development & innovation system) and intangible resources (trademark, business reputation, managerial skills, and expertise).

(2) Spread risks. The purpose of diversification and adopting multiple business portfolios is, in a sense, to reduce and spread risks (Chandler, 1962). It is not hard for a company to gain a leading competitiveness in a certain industry, but difficult for it to maintain this position as the competitive environment changes. If the company only engages in a single business, then most probably it will fail due to the decline of this line of business. So it becomes a direct reason for enterprises to reduce risks through diversification, instead of putting their assets in a single business. Thus enterprises avoid the risks of engaging in a single business through expanding the scope of business and identify suitable portfolios.

(3) Save transaction costs: Coase (1937) had pointed out, transacting in markets would lead to costs, which can be absorbed within an enterprise, so many economic activities are conducted within an enterprise which replacing market transaction with in-house cooperation. These costs include the time and expense spent on negotiation development and contract performance, which is also known as transaction cost or transaction expense. Given that there're a large number of links and aspects for coordinated design and production within a large corporation, diversified operation or diversification based on diversified production would internalize a lot of transactions, thus reducing costs and enhancing transaction efficiency; in addition, the expertise, skills and tacit knowledge of an organization of human capital, through internalization of transaction, can be utilized to avoid repeated negotiations and mitigate the risk of opportunism, reducing the overall transaction costs.

(4) Reduce managers' employment risks. Diversification can reduce the employment risks (unemployment risk and the risk of salary cut) of senior managers. That is to say, provided that the profitability of an enterprise is not compromised, the senior managers will diversify the company's business for the purpose of reducing their employment risk (Lane, Cannella, 1998). Diversification can enable managers access to the benefits not entitled to shareholders. Diversification is highly correlated to the size of a company, the bigger a company is , the higher its compensation for senior managers (Gray,et.al., 1997).

Theoretically, enterprises can reduce operational risk by means of diversification.

However, a number of research literatures on strategic management have proven that, the operation performance of enterprises that diversify is worse than those adopting other business strategies. This gap between theory and practice, known as the "paradox of diversification", has been troubling enterprises. Diversification proposes higher requirements for enterprise in many ways. The first is the requirement for an enterprise's resources and competency. In practice, however, the resources and competency of any enterprise is limited, thus diversification may increase operational risk during the process of execution the strategy. Moreover, the selection of the timing of diversification depends on an enterprise's apprehension of the future trend of a new business, and requires comprehensive consideration of the enterprise's competitiveness and the growth potential of its existing businesses, which undoubtedly poses higher requirements for the enterprise's decision making capability. Finally, after venturing into a new business, the integration of different businesses is also critical. The success or failure of integration, to a large extent, would affect the operation of the new business, and even affect the overall operation of the enterprise. (Li, 2001)

2.4 Conclusions of literature review

The above review of literature of enterprise development theory, development strategy theory and industry value chain theory reveals that:

(1) We can see from enterprise development strategy theory that scholars' perspectives of enterprise study has turned to external of enterprise from internal of enterprise and finally returned to internal of enterprise. Nevertheless, present research and study has put too much emphasis on oneness of perspective. In fact, both resources and capabilities within enterprises and environmental factors outside enterprises should be taken into consideration for management of enterprise development strategy. Only in this way can the enterprise be well aware of itself and its enemy and succeed when formulating strategy.

(2) Enterprises' choice of diversification strategy is a rather complex process. When deciding whether to carry out diversification strategy, enterprises should start with motives of diversification. Only when motives of diversification are figured out can direction for choosing

diversification strategy be clear. The thesis is in the opinion that the main driver for diversification is to consolidate an enterprise's dominance within its industry and enhance its resource allocation efficiency, finally facilitating sustainable development. The development of an enterprise is not only reflected on expansion of its size, but also the improvement of quality. Therefore, in actual process of choosing diversification, enterprise should follow the core of strategy selection, that is, fully analyzing resources and capabilities of the enterprise, carefully identifying environmental factors outside the enterprise, and finally decide whether to and how to carry out diversification strategy. Then in this process how to analyzing environment outside the enterprise and how to adapt resources and capabilities of the enterprise to environment have become urgent problems needed to be studied.

(3) From review of literature relating to choice of diversification strategy, we can see that most researches analyze environment both inside and outside the enterprise on theoretic basis and reach to a conclusion with high universality at last. But in fact, specific enterprise has distinct industry features and enterprise features, so for specific enterprise in a specific industry, when make decision on diversification strategy, problems to be considered will be different. As engaged in state-owned military chemical enterprise, the author know that at present there have been no literature on research of decision-making act concerning diversification in area of state-owned military chemical enterprise, so study and researches of this area are needed to be conducted.

(4) Although many scholars have given definitions of industry value chain, all of the definitions are just not complete. Different understandings of scholars from different perspectives reveal that there is, currently, still no uniform definition of industry value chain. Therefore, a more scientific and consistent definition of industry value chain is required in the academic world. If a scientific connotation of industry value chain is available, thus the theory is able to cover plenty of theories or concepts the scales of which have not been formed. As a result, the research strength of this field will become more concentrated, thus achieving the "join-force" effects of academic research.

(5) Seen from the sorting and conclusion of literatures regarding industry value chain, there are, currently, a great number of literatures applying relevant theoretical results of

industry value chain to study problems existing in specific industries. The application areas involve such specific industries as media, telecom, tourism, finance, automobile, culture, agriculture, medicine, software, real estate, game, foreign trade and electricity. However, it is not hard to find out that what applied in most literatures is just simple analysis of industry value chain and application of more advanced results can still be hardly found. There is particularly no literature on the analysis of the value chain of military chemical industry available for reference.

Chapter 3: Methodology

3.1 Research methodology

3.1.1 Research methodology

This thesis mainly researches strategic choice for development of China's state-owned military chemical enterprises. There are two major objectives: first is to describe and characterize the developments of Chinese enterprises, which is essential to further research on strategic choice. Otherwise, strategic choice will lose its criteria, and even lose the meaning of such a research. Second is to discuss key factors impacting enterprises' choice of strategy, and based on those factors, enterprises can make a correct choice of its specific strategic plans. According to those objectives, concrete research methodology of this thesis is as follows:

The first step is to establish enterprises development model. By sorting the relevant documents about enterprise development, the thesis extracts various indicators to measure enterprise development. According to internal logic relationship among indicators, the thesis establishes a model to accurately depict enterprise development. As a means to test diversification strategic choice, such a model is the basis for further research.

The second step is to build enterprises' diversification strategic choice model based on SBU. For the purpose of promoting enterprise development, the thesis first conducts a comprehensive comparative analysis of all industries the company's current businesses are engaged in, from such aspects as growth, competitiveness, profitability, structure, scale, relation, supply chain and value chain of each field. The aim of evaluating each business by those indicators is to find out the most potential business to form an alternative business set for the company's strategic planning, i.e., business set in which the company is most likely to be engaged. Then, the thesis analyzes the company's internal assets quality, business operation capability, financial management capability, marketing capability, cost control capability, technological innovation capability and human resources. Through analysis of internal

resources and capabilities, a resource and capability set can be obtained, i.e., the current and potential outstanding capabilities of the company – its competitive advantages. In accordance with the principle that external environment shall match internal resource and capability, a further growth analysis of the intersection of the above two sets can be made by adopting BCG Matrix Analysis and McKinsey Evolution, to finally select the most favorable business unit for enterprise development.

The third step is to make research on diversification strategic choices of state-owned military chemical enterprises. According to the enterprise development model and SBU-based diversification strategic choice model, the thesis analyzes the characteristics of the state-owned military chemical industry through the collected relevant data of the industry, and abstracts the main factor which worthy attention when making diversification strategic choice, and finally makes choices based on those factors.

3.1.2 Theoretical principle

Porter (1985) thinks that competitive advantages, ultimately, root in the value higher than the cost created by the enterprise for its customers. Meanwhile, he points out that it is necessary to divide the operating activities of the enterprise when analyzing competitive advantages and conduct research based on level of operating links. That's how value chain is introduced as the analysis tool. Value chain put forward by Porter (1985) is regarded as the traditional internal value chain which primarily focuses on the internal value activities of the individual enterprise and directly regards profit as the objective of the value chain. Shank (1992) indicates that the value chain of an enterprise is not just internal value activities of the enterprise. Instead it shall involve the whole process from initial raw material purchased from suppliers to ultimate product sold to users. Porter (1997) also notices that the value chain of an enterprise might be involved in a larger "Value System" which includes the value chains of suppliers, selling channels and customers. Hence, it is necessary to analyze value creation and value acquisition based on the industry level. In order to precisely analyze the competitive advantages of an enterprise, definition of relevant value chain based on industry level is in request for competition of enterprises of a specific industry. Although the value chains of enterprises of an

industry might differ due to different product line characteristics, buyers, sellers, geographical areas or distribution channels, enterprises of the same industry have similar value chains based on industry level. Pan (2001) holds that industry value chain is gathering of enterprises with cohesive relationships on the basis of a certain core technology or process for the purpose of providing utility systems to meet the demand of consumers. Therefore value realization of the industry value chain is no longer the results of efforts of a single enterprise but cooperation between enterprises in the chain.

In Porter(2002)'s Competition Strategy Framework, he positions value creating activities in the center and regards enterprises as strategic activities to adapt to the industry environment through seeking advantageous strategic positioning. Concentrating on the central role and positioning strategy of value activities of enterprises, he thinks that resources are acting as an intermedium in the causal chain of achievement of enterprise performance and enterprise resources can be obtained through performance activities of the enterprise and procurement from the environment (Porter, 1991). Whichever channel was applied, effective resources are of necessity for strategic choice.

However, resource-based view (RBV) sees this matter from the opposite point of view. Baney (1991) thinks that enterprise is combination of resources and capabilities and the sustained competitive advantages of the enterprise come from resources and capabilities controlled by the enterprise. Valuable and rare, these resources and capabilities can not be completely simulated and replaced. Lippman & Rumlt (2003) hold that value creation comes from two aspects: (1) developing complicated "natural" resources including knowledge, know-how, social capital and other social and complex resources not easily being transformed; (2) integration of resources. Hence, according to RBV, enterprises shall consider the resources and capabilities owned when making strategic decisions as success can only be achieved when resources and capabilities owned are able to support the future choice of development areas. Strategic choice in the only basis of value enhancement is bound to lead to a wrong path of strategy choosing.

Wang (2005) has combined the aforesaid two views. He indicates that there are three main elements affecting value creation under the industry value chain including value enhancement

of superior products, core capabilities of enterprise and relationships between enterprises. Therefore, measurement of the industry value chain should take overall consideration of these three aspects of the node enterprises of industry chain node rather than making corresponding adjustment of free cash flow only based on subjective judgment of the appraiser.

It can been seen from the above theoretical analysis that as for node enterprises of industry chain, value enhancement and resources and capabilities owned by enterprises are primary factors need to be focused on when choosing strategy. Based on this, this thesis will further study the choice of development strategy of state-owned military chemical enterprises. Core research contents of this thesis include: which factors will affect the strategic choice of state-owned military chemical enterprises, whether value enhancement and resources and capabilities owned are the main factors, and how do these factors affect strategic choice of these enterprises.

Two theories prevail with regard to enterprises' strategic choice mechanism, i.e., natural selection and adaptive learning mechanism. Natural selection is a mechanism by which individual organisms or groups of species may increase fitness and enhance adaptability to the survival environment. Study of industrial chain and enterprises on the node thereof remains at the strategic choice theory under the external dynamic environment. Economic theory of modern evolution advocated by Nelson and Freeman has fully accepted the idea of "Natural Selection" which is the core of Darwin's biological evolution. They believed that the economic world is quite similar to the natural world since enterprises also compete with each other in the market. Industrial evolution theory of evolutionary economics is based on the enterprise growth theory. Choice mechanism (i.e. natural selection) of enterprises in the industry chain has dominated the industry behavior, and the choice will inevitably affect the possibility of enterprise growth in the industrial chain. Profitable enterprises can access to the resources of their original investment and expand their business. They will continue to expand and grow while unprofitable enterprises will have to shrink and fall behind till they lose out (Alchian, 1950). Profit-making enterprises are finding ways to thrive and prosper, whereas any of them failing to do so will sooner or later be removed from the market. In order to maximize utility and become invincible in the competition, the node enterprises of industrial chain must

continuously innovate so as to expand their own advantage and market share. In this sense, they surely should choose the path of market competitiveness.

Friedman (1953) pointed out that the profit maximization assumption is not very useful in explaining the behavior of an individual enterprise, but it is most applicable for the industry as a whole. Becker (1962) proved the effects of changes in enterprises' aggregate production opportunity on the changes in industry behavior without having to assume a rational enterprise behavior. He believed that the purpose of choose is to "maximize harvest". Thus, from the perspective of industrial chain, the choice of individual enterprises could lead to a long-term industrial fluctuation, but it will also maintain a long-term steady development momentum. This point is interpreted by Friedman and Alchian as the generation of choice behavior, where it exists a force of enterprise's internal role as well as an external force acted on the enterprise. Such force will enable the node enterprises of industrial chain who strive to maximize their positive profit to excel those enterprises who fail to do so. Hence, this has embodied the superiority of the choice behavior.

Enterprise ability theory has further identified the root cause of enterprise competitive advantage. However, by what is the ability to form a competitive advantage determined? Therefore, the discussion on the enterprise competitive advantage has yet to continue. The question we need to further explore is that: what is hidden in behind the ability? A further in-depth study on resource theory and ability theory suggests that both the ability theory and the resource-based enterprise theory emphasize that the ability of enterprises is derived from the enterprise's "unique resource". Such “unique resource" is nothing more than the knowledge owned by each enterprise that is difficult to trade and imitate. Enterprise knowledge theory suggests that the key factor hidden behind the enterprise ability that determines the enterprise competitive advantage is the knowledge acquired by the enterprise. In particular the tacit knowledge unlikely to be imitated by competitors as well as the cognitive learning closely related to the knowledge.

Becker (1962) distinguished and defined three types of knowledge, namely the general or common knowledge, the firm-specific knowledge, and the industry-specific knowledge. These three different types of knowledge are interrelated. From the perspective of relevance of

enterprise growth, the continued accumulation and idleness of firm-specific knowledge is the most fundamental motivation for enterprise growth. Such knowledge is often acquired from the general knowledge and industry-specific knowledge. Besides, these three types of knowledge are always in the cycle of continuous exchange and complementation. Ikujiro Nonaka proposed the knowledge innovation model in his thesis *Knowledge Innovation Enterprise* published in the *Harvard Business Review*. He believes that the enterprise's reaction mechanism against the changes in the external environment is the key to understand the enterprise growth. In an uncertain economic environment, knowledge is undoubtedly a source of sustainable competitive advantage and development for the enterprise. He said: "Along with the decline of original market, rapid advance of new technology, doubling of competitors and quick phase out of products, no enterprises except for those who continue to create and spread new knowledge throughout the organization and rapidly develop new technologies and new products may become successful. Such enterprises are called new knowledge enterprises, and their core task is continuous innovation." It is not the formal systematic knowledge but the hypertext tacit knowledge contained in the organization that actually forms the long-term competitive advantage for the enterprise. The source of enterprise competitive advantage is the specific knowledge innovation ability based on the knowledge resource.

Enterprise knowledge theory suggests that the enterprise growth process is the dynamic accumulation and innovation of productive knowledge. Specialized production sharing can result in specialized knowledge accumulation and innovation as well as the absorption and learning of external knowledge. The learning of external knowledge will give rise to the diversification of productive knowledge. Such diversification will further lead to the diversification of production activities of the enterprise. Similarly, the internationalized growth process is the evolution of dynamic learning. After accomplishing domestic diversification, the enterprise will gradually come into contact with the foreign productive knowledge and experience along with the expansion of business activities. The internationalized growth will gradually be achieved through learning and accumulation of knowledge.

Enterprise's sustained competitive advantage stems from its scarce and valuable resources that cannot be completely imitated and substituted (Barney, 1991). Such resources include

technology, information, knowledge and organizational procedure. The exclusive knowledge owned by the enterprise that embodies its own characteristics and is unlikely to leak has been widely recognized as the unique source of unduplicated competitive advantage. Moreover, with the gradual rise of virtual business, the demand for information exchange and knowledge sharing among organizations has also become increasingly prominent. Meanwhile, in order to adapt to the external environment changes, the knowledge management aimed at enhancing organizational adaptation, survival ability and competitiveness has come into being. If the enterprise on the industrial chain can properly adapt to the environment changes, accurately identify its competitors and take effective response measures, it will turn into an ability which will become a source of competitive advantage.

Natural selection of the node enterprise of industrial chain refers to the changes in a group while adaptive learning refers to the changes in individual enterprises. Natural selection, as a concept, has presupposes the individual stagnation. That means it has presupposed that there exist stable and heritable characteristics in a group. On the contrary, the adaptive learning has explained the instability and the changes inside the individuals. Adaptive learning can change the "plan" of the individual. Internal changes of the enterprise's individual principals may not only be attributed to the changes of their faith but also attributed to changes in their business goals. This is because the principals tend to raise their level of desire when they can easily achieve satisfactory results. On the contrary, they tend to reduce their level of desire when they cannot achieve satisfactory results. Thus, they adjust their goals to adapt to changes.

Secondly, adaptive learning requires each learning individual to “register” the causal relationship between a particular behavior and its result in another way. Such "register" does not have to involve the awareness of this causal relationship. However, conscious awareness may be deemed as a "standard" method to "register" in the adaptive learning. "Register" is not required in the Darwinian natural selection. In the Darwinian natural selection, the difference in duplicating success is "directly" delivered to the difference in gene frequency growth without any intermediate "register".

The third difference involves the "elimination" of individuals with poor adaptability. This is attributable to mandatory removal in the natural selection. Individual enterprises with poor

adaptability ("inadaptable") are assumed to accept the grim results since they cannot avoid the selection. Such enterprises may have no chance of survival. In the economic society, we can see that the individuals with the survival chance tending to zero will no longer be able to play a role (at least they can no longer play their previous role as a market participant). However, an individual principal can "save" his/her behavior that cannot produce satisfactory results by reducing his/her desire level. As a result, dissatisfactory results may become satisfactory. This means that the "elimination" based on adaptive learning is selectable.

Even if individuals cannot adjust their level of desire, the fourth difference still exists. In natural selection, the standard for duplicating success is the same for all the individuals in a group. Thus, this standard can be considered to be objective. In the field of industrial chain, this means that possessing positive material resources is a necessary condition for sustainable survival of the enterprise. Regardless of whether the enterprises are pursuing profits, they have to obtain material resources in order to be able to maintain their business. On the other hand, all individuals involved in adaptive learning may have different levels of desire, motives and goals. Therefore, there may be a large number of subjective criteria.

In order to obtain sustainable competitiveness, core enterprises within the industrial chain will surely conduct a continuous strategic positioning of its existing business within the enterprise and constantly adjust its business to adapt to the market changes. However, the core enterprise managers within the industrial chain are unlikely to search out all the strategic development businesses that are feasible in principle. Instead, they may only consider a subset of the "complete set" or a most efficient strategic business. Such subset or business is also the business object with most strategic potential in the industrial chain.

3.2 Methodology

In order to achieve research objectives of this thesis, case study method is mainly applied in this thesis. The type, objectives and steps of the case study method are outlined as follows:

3.2.1 Objectives and significance of case study

Case study refers to a research method on a certain experiential and empirical subject following a set of procedures and steps formulated in advance. (Robert, 2004) Case study is also what we usually called typical survey which is effectively applicable to research subjects, the specialties of which are hard to be made abstract and where direct answers to "Why" and "How" questions are available (Yin, 1994; Stake, 2000). Compared with other research methods, case study is more applicable to research on strategic management because researchers have no control of strategies of enterprises, which is also one of the reasons for why there is almost no experimental study on strategic management (Xiang, 2005). Based on data and experiential knowledge obtained and coded, case study can analyze the logical relationships between different variables and further inspect and develop the existing theoretical system.

Case study method, along with experiment and questionnaire survey, is regarded as a primary study method in social science. It is an experiential research method implementing in-depth and comprehensive on-the-spot investigations on a certain complicated and specific phenomenon in real life (Sun, et.al., 2004). Case study's becoming a scientific paradigm is connected with the rise of neoinstitutional economics. Neoinstitutional economics, as a school of economics taking transaction cost as analysis paradigm, sprung up in western countries between 1950s and 1960s. It argues that it is difficult to subject institution analysis to quantitative, mathematical and formal treatment as it over-emphasizes the differences. Wang (2004), a Chinese scholar studying neoinstitutional economics, said that institutional economics dislikes statistics but favors case study, which is one of its characteristics. And another characteristic of institutional economics is that it dislikes math but favors descriptive methods. It is for this reason that case study has become a common tool and basic theory of neoinstitutional economics. Cheng(2001) presented a report titled "Conscentiously Conducting Case Study to Facilitate the Development of Management Science and Management Education" at the "Seminar of Marketing Theories and Methods and Domestic Cases of Enterprise Management in New Economy Era" held by Hong Kong Baptist University. He pointed out in this report that case study is indispensable in understanding the objective world

and is a powerful tool to handle complex problems. He also said that it is very dangerous to make decisions merely based on statistics, and case study can complement statistics.

Scientific application of case study method can not only analyze complex phenomenon influenced by various factors but also meet the demands of some pioneering researches, especially demands of researches aiming to establish new theories or refining specific concepts of the existing theories (Yu, 2004). For the purpose of combining theories and practices, it is necessary for the research to carry out in-depth investigation on typical research objects based on theoretical analysis in previous chapter. Combined with literature analysis, research on specific case of state-owned military chemical enterprise in terms of strategic choice has been conducted so as to understand the essential problems focused on by these objects when making strategic choice through analysis of one typical case of these objects. Meanwhile, it is required to implement long-term tracking research and systematic conclusion of typical case when conducting case study.

Therefore, on the basis of literature analysis, the research has adopted case study method to explore the process and mechanism of strategic choices of state-owned military chemical enterprises as well as further dig factors affecting strategic decisions of these enterprises.

3.2.2 Type of case study

Case study is a kind of experiential research and is largely different from pure theoretical research. Case study is revealed as a kind of empirical research using various data sources to investigate a current phenomenon, which is hard to be separated from its background, in the real world (Yin, 2003). Case study aims at producing new theories or replicating the existing ones during which new views on the existing theories are often produced, which expand or narrow the application scopes of the original theories (Xiang & Zhang, 2005), apart from supporting the validity of the existing theories.

Apart from reconfirming the existing theories, case study can also produce new theories through case analysis or existing theory testing (Yin, 2003; Ye, 2006). According to the difference in research objectives, case study is divided into such four types as exploratory, descriptive, explanatory and evaluative (Bassey, 1999; Sun,et.al., 2004).Bassey (1999) has

given a vivid description of these four type case studies. He points out that exploratory case study emphasizes on raising assumptions to seek (new) theories; descriptive case study emphasizes on describing cases in a way of story-telling or picture-drawing; explanatory case study emphasizes on theory testing and evaluative case study emphasizes on judging specific cases. Primary objectives and research emphasis of these case study methods are indicated in Table 3-1.

Table 3-1 Case study method

Type of case study	Primary objectives	Research emphasis
Exploratory case study	Seek new views on things or attempt to adopt new views to evaluate phenomenon.	Emphasize on raising assumptions
Descriptive case study	Precisely describe the outlines of people, incidents or situations.	Emphasize on describing cases
Explanatory case study	Summarize the phenomenon or research results and make final conclusions; investigate relevance or causality problems.	Emphasize on theory testing
Evaluative case study	Raise its own comments and views on research cases.	Emphasize on judging specific cases

Data source: Analysis of research results of Sun, et.al. (2004) and Yu (2004)

In addition, based on the number of cases used in actual research, case study can also be divided into Single Case study and Multiple Cases study.

Single Case study is mainly used for proving or falsifying one aspect of the existing theory assumptions or analyzing an extreme, unique and rare management situation. Scholars favoring Single Case study think that this research can reveal in-depth economic background of the case so as to ensure the reliability of case study. In China, a large group of scholars such as Wu,et.al. (1995, 2009), Zhou (2005), Wang, et.al. (2008), Yu & Wang (2008) have adopted Singe Case

study and built their theory frameworks through case study.

As for Multiple Cases study, researchers, first of all, will carry out in-depth analysis of each case and its theme independently which is called Within-Case Analysis. Based on the same research gist and independent analysis of each case, researchers will summarize and conclude all the cases to draw abstract and incisive research conclusion, which is called Cross-Case Analysis. Scholars represented by Eisenhardt(1989) favor Multiple-Cases study. They hold that Multiple-Cases study can better and more comprehensively reflect different aspects of case background and the validity of case study will be substantially improved especially when the same conclusion can be drawn from various cases simultaneously.

3.2.3 Steps of case study

Eisenhardt(1989) points out that case study for theory building mainly follows eight steps:

(l) Define research issues and find possible leading concepts before case study;

(2) Focus on specific group and choose suitable subjects and cases on the basis of the theories;

(3) Adopt various data collection methods and design measurement tools;

(4) Collect data on site and combine instant data analysis to maintain the resilience of data collection;

(5) Implement Within-Case Analysis and Cross-Case Analysis;

(6) Form research assumptions on the basis of comparison and test;

(7) Compare the new concepts, theories or assumptions with existing literatures;

(8) End case study when theory reaches saturation as far as possible.

Yin (2003) divides case study into five steps i.e. research design, preparation of data collection, data collection, data analysis and compile research report. Basic models of case study design are:

First is to define research issues;

Second is to raise theory assumption,

Third is to define organization to be analyzed;

Fourth is to form connection data and logic of the assumption;

The last is to explain standards of research results.

Combining views of various scholars, this thesis, on the basis of analysis and comments on existing literatures, forms theoretical presupposition and research concepts and finally build theory models of the procedures and mechanisms of industry value chain-based strategic choice of state-owned military chemical enterprises through case choosing, data collecting and analyzing, and primary research conclusions drawing after summarizing and analyzing.

3.2.4 Other study methods adopted in this thesis

In order to achieve the research objectives, this thesis also adopts the following study methods apart from case study method:

First is the combination of theoretical research and practical analysis.

Based on enterprise development theory, competition strategy theory and diversification strategic choice theory, we carry out comprehensive research on the concept, significance and system of diversification strategic choice of China's state-owned military chemical enterprises, with strong theoretical value. Meanwhile, we combine practice of China's state-owned military chemical enterprises' development, analyze realistic problems of their development and diversification strategic choice mechanism, so as to provide countermeasures and suggestions for diversification strategic choice in accordance with various objectives, making this thesis of both theoretical level and practical significance.

Second is the combination of logical deduction and empirical induction.

The logical deduction means to derive conclusions based on known theorems. The thesis establishes hypothesis and model with this method. Wrong assumption may be exist for that the error cannot prove itself on its own, thus empirical induction method is used to test. Empirical induction refers to prove conclusions by using survey findings. But it is incomplete and needs to be testified whether the conclusion from limited materials is significant or not by adopting logical deduction. For example, in characterization study of enterprises' development, the

thesis combines those two methods. It analyzes and deduces theoretical model of enterprise development through collection, collation and analysis of existing research achievements at home and abroad. Meanwhile, in order to test the rationality of such a theoretical model, we carried out case study of LNCC by such ways as visiting and symposium. We also adjusted each parameter by applying empirical evidence, and finalized the depict model of enterprise development.

Third is the integrated method.

Enterprises' development not only involves the growth of business performance and expansion of business scale, but also includes the rise of resource efficiency and capability increase. Therefore, only a development theory can hardly give a full view of development of enterprises. Therefore, combining a variety of enterprise development theory can really make comprehensive and detailed characterization of enterprise development.

3.3 Research data

3.3.1 Data collection and processing

As suggested by Yin (2003), material collection for the research has been carried out in accordance with the following principles:

(l) Collect data from various sources so as to improve validity of the research. Based on various data sources and collection forms, data and material collection for the research was carried out in such ways as staff interview and secondary data analysis. As for each exploratory case study, the senior management of the enterprise and executives of such departments as Technical Department, Procurement Department and Sales Department were invited for semi-structured depth interview (please refer to Appendix 1 for interview outline and list of interviewees) with each interview lasting for one and a half hours or so. The term of service of senior management of the enterprise receiving the interview are above 3 years while that of the middle management of the departments are above 2 years, which ensure more comprehensive and thorough understandings of the enterprise situation by personnel receiving the interview. After the interview, another round of communication with the interviewees was conducted in

such forms as telephone, Email or another face-to-face talk so as to supplement information required and verify the information records sorted out. In addition, the research collected and sorted out secondary data of the enterprise through asking for and looking up internal documents and materials of the enterprise as well as utilization of public information from enterprise website, brochure and industry news.

(2) Relevant materials and data obtained during the case study process were recorded in detail so as to improve the reliability of the research. The materials obtained for the research primarily include: authentic data and analysis report on the business condition provided by the case company, documentations related to the case study, as well as forms, written descriptions and analysis materials produced from interviews with the case enterprises. Before the interview, relevant public information of the case enterprise has been collected from the internet. With the approval of interviewees, sound recording and on-site word recording was carried out during the interview and the interview records were sorted out and analyzed within 12 hours after the interview. Additionally, the publicity materials and relevant internal files of the enterprise were obtained from the interviewees, all of which, classified, coded and filed for data analysis in subsequent steps.

3.3.2 Data composition

In order to study how China’s state-owned military chemical enterprises make strategic choice and finally realize the objectives, relevant data and documents are collected in this thesis through various ways, providing protection to theory building and evidence testing of this thesis. Data mainly include the following:

(1) China's macroeconomic data and Sichuan’s macroeconomic data

Data contents: for analysis of macroeconomic environment of China’s chemical industry and LNCC, China's macroeconomic data in this thesis include: GDP in 2000-2010, GDP index, GDP growth rate, gross industrial output of industrial enterprises above designated scale by industry; Sichuan macroeconomic data consist: province GDP in 2000-2010, GDP index, GDP growth rate, gross industrial output of industrial enterprises above designated scale by industry.

Data acquisition: China Statistical Yearbook and Sichuan Statistic Yearbook 2000-2010

respectively for China's macroeconomic data and Sichuan's macroeconomic data.

Data analysis: GDP and GDP index and GDP growth rate of China and Sichuan are mainly used to analyze economic growth trend of China and Sichuan, reflecting development state of macro economic environment. Macro economic data as gross industrial output of industrial enterprises above designated scale by industry are used to analyze overall development and trend of chemical industry and relevant industry.

(2) Macro data of China's chemical industry

Data contents: in order to analyze development and current operation of China's chemical industry, macro data of China's chemical industry are composed of the following: overall production data and sales data from 2000-2010 of China's chemical industry; overall production data and sales data of such chemical products as basic inorganic chemical raw material, high polymer material, coating & organic pigments, and fine & specialty chemicals.

Data acquisition: China Chemical Industry Yearbook 2000 to 2010. But because statistics of the yearbook are classified by chemical products, it is hard to tell the overall development state of the whole industry. And summation operator is carried out on production data and sales data of relevant chemical products in this thesis, so as to obtain the overall production data and sales data of China's chemical industry.

Data analysis: Overall production data and sales data of China's chemical industry are mainly for analysis of development and operation state of China's chemical industry. Production data and sales data of such chemical products as basic inorganic chemical raw material, high polymer material, coating & organic pigments, and fine & specialty chemicals are used to make analysis on chemical product operation involved in business of LNCC.

(3) Business data of LNCC

Data contents: in order to analyze the internal operation and development of LNCC, business data collected in this thesis include the following: business data containing sales revenue, total profits, total assets and staff from 1990 to 2010 of LNCC, such business data as sales revenue, total profits, total assets, production volume of main product, unit cost and price and staff from 2000 to 2010 of subsidiaries of LNCC, production data of main civil product

from 1990 to 2010 of LNCC and sales data of main civil product from 2009 to 2010 of LNCC.

Data acquisition: the data offering core data support for the research are mainly collected and provided by LNCC. The following work is also done for accuracy and completeness: 1. evaluating the data provided by LNCC to ensure that important data are completed; 2. repeating data copy for many times to prevent data loss; 3. carrying out reduplicative researches the company, and comparing data provided by the company and original data to ensure accuracy.

Data analysis: business data of the company are mainly for analysis of operation and development of the company, meanwhile, the development process of the company can be seen through longitudinal data analysis, so as to test the enterprises development model built in this thesis. Business data and production & business data of main civil products of subsidiaries of the company are used to analyze SBU development condition of the company.

(4) Business data of major competitors within the industry

Data contents: in order to analyze the company's competing environment and the operation of its major competitors, business data of major competitors within the industry contain the following: production capability and production data of domestic enterprises merely producing organic silicon as of 2009; operation revenues, operation cost and profit margins of organic silicon business of leading enterprises within the industry from 2009 to 2010; production capability data of enterprises producing sodium carboxy methyl cellulose as of 2009.

Data acquisition: production capability and production data of major competitors are provided by LNCC in accordance with relevant research report. As companies have set these data as confidential, it is difficult to collect them and some data collected may be distorted. In order to prevent interference caused by data distortion, this thesis has also collected online data and calculated weighted average data through various ways. The weight values are defined by Delphi method. Relevant personnel of the company check the data repeatedly, and agree that the data can reflect operation condition of its competitors. Therefore sample of data processed will be fully retained during research in this thesis. In addition, leading companies are defined as listed company within the field in this thesis, thus data obtained mainly come from financial data disclosed in annual report of those companies.

Data analysis: capability, production and business data of main competitive products of major competitors are used to analyze external competition environment of LNCC, and its competitive position and competitiveness. Moreover, SBU competitiveness can also be analyzed through its competitor's product data, so as to provide data support for its strategic choice.

(5) Text data

Data contents: in order to make full analysis of basic SBU condition of LNCC, a great deal of text data are also collected in this thesis, mainly including the following: development history of the company, product development history data, supply and demand situation and market competition of partial major product, and main product competitiveness analysis report of the company. Moreover, writer of this thesis has repeatedly interviewed senior management of the company, with conversation contents sorted into text and included into text data.

Data source: the data of this part are sorted mainly based on report, planning and company introduction provided by LNCC. In addition, partial text data are recorded through interview.

Data analysis: the contents of this part mainly provide a "window" for the research, enabling researchers to discuss position "inside the window" by analyzing and understanding the contents, so as to help the researchers to build relevant theoretical framework and model. Specifically, some contents can help to analyze development process and current operation of the company, be used to observe its previous strategic choice and the impact, and also to analyze the competitiveness of diversification strategic segments.

Chapter 4: Case Company Selection and Company Overview

Literature review of the previous chapter has laid a good theoretical foundation for research of this thesis, based on which, this chapter will conduct a case study on LNCC with regard to the strategic choice of state-owned military chemical enterprises. As LNCC is a typical state-owned military chemical enterprise with two distinctive features: one is that this kind of companies is few domestically; the other is that the technical content, sales volume and customers of its major products are strictly confidential. In light of this, the thesis adopts the method of explanatory Single-Case study when conducting research. The research procedures are: extract primary management theories to be explained though literature analysis and finally build theory models of the procedures and mechanisms of industry value chain-based strategic choice of state-owned military chemical enterprises through case choosing, data collecting and analyzing, and primary research conclusions drawing after summarizing and analyzing.

4.1 Basis of selection of case company

As for selection of cases, except for case study for theory testing which may adopt statistical sampling to select cases, most case studies are implemented through theoretical sampling (Glaser & Strauss, 1967). Statistical sampling refers to sampling of a typical object for research use at random from its clear parent group while theoretical sampling means that unique, supplementary or critical cases will be selected intentionally as required by the research on the basis of the theories rather than statistics concepts. For example, extreme cases might be chosen for theory development; cases with similar conditions might be chosen for theory replication and cases in compliance with theoretical elements might be chosen for theory testing.

In China, specialty military chemical enterprises play a very significant role in providing Chinese army with necessary chemical materials and equipment for military use. Hence, these enterprises are controlled more strictly than common enterprises by the government.

Meanwhile, the government has started to allow and support domestic state-owned military chemical enterprises to enter into the area of civil products and participate in market competition with the support of the advanced producing and research technologies of chemical products since reform and opening up. Therefore, these enterprises have double properties as plan oriented and market oriented, which provides a whole new research background for research of this thesis. On the basis of the research objectives of this thesis and double properties of state-owned military chemical enterprises, the selection of case company of this thesis follows the following standards:

Firstly, the case company must be an enterprise typical of the characteristics of China's specialty chemical industry. For example, the management organization includes the position of Party Secretary of CPC Committee; major decisions are submitted to the approval of superior group company; and there should be a production line for military products, besides, the operation and management of the production line shall be typical of the management of state-owned military chemical enterprises.

Secondly, as some companies of a large number of companies in the industrial chain have low positions in the industrial chain with no capability of integrating and optimizing the industrial chain, the case company we select must possess powerful strength or be in the leading place which basically has the capability of integrating and optimizing the industrial chain.

Thirdly, since most data of the military products of the domestic specialty chemical enterprises shall be kept privacy strictly and the research of these data by civilian researchers is not allowed, the case company we select must has civil product production line the operation of which shall has the features of operation of state-owned military chemical enterprises.

Fourthly, the confidential coefficient of the civil product production line of the case company shall not be too high and the company is willing to cooperate with the researchers. Relevant data and materials can be acquired through investigation and interview, thus ensuring smooth conduction of the research work.

4.2 Basic introduction of case company

According to theoretical principle of the above-mentioned case study and case selection criteria, in combination with work experience of researchers, LNCC was ultimately selected as research sample for case study of this thesis. Brief introduction of the developing process of LNCC will be given below following main research purpose of this thesis.

Looking back 70-year development of LNCC, its developing process includes the following 4 stages:

Stage I: 1933-1949: Establishment period. Major products of the company were bullet, chemical weapon and protective devices;

State II: 1949-1980: Stable survival period. The company was in an age of planned economy. No major breakthrough was made at that time, development of the company kept steady, and products were military product-oriented.

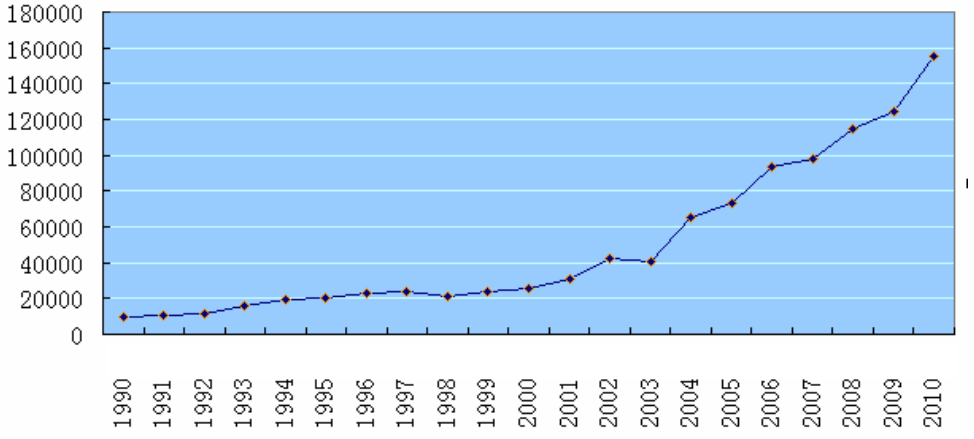
Stage III: 1980-1990: A period of reorganization, changes and breakthrough. As production task of military products decreased sharply, LNCC began to focus on R&D and production of civil products like cellulose esters, ethers products and synthetic chemicals, and tried to start marketing operation. However, due to established ideas, systems and mechanisms under long-time planned economy model, together with lack of experience of competition in market, LNCC had suffered losses of successive 10 years;

Stage IV: Since 1998: A period of reform, innovation and development. In this period, after experiencing reforms and hardships of last stage, LNCC gradually adapted to rapid changes in external environment. It adopted relevant solutions and developed new developing strategies, forming a pattern of coordinated development of military and civil products while the military-based state where civil products develop the industry taking shape. Finally, the company developed rapidly and got out of difficulties, entering into a new stage.

By 2010, sale of the company has maintained double-digit increases for successive 9 years, with annual mean growth of 26%. In 2010, total assets of the company exceeded 350 million Euros, and total sale performance reached 156 million Euros (excluding nitrocellulose) (see

Figure 4-1), wherein civil product business took up 93%.

Figure 4-1 Sale of LNCC during 1990 and 2010 (Unit: 1,000 Euro)



Data source: Financial statements of the company

In addition, for that this research is conducted on basis of civil products business, this thesis has also specially reviewed developing process of civil products of LNCC for the last 30 years, including the following stages in general:

In early 1980s, the company had successively constructed several production lines of CMC sodium, nitromethane and miniature automotive fuel tank, and established the second research institutes engaging in development and research of civil products, laying a foundation for development of civil products in such areas as cellulose derivative products, synthetic chemicals, machining operation and industrial explosive materials.

Since 2001, the company started to implement division and restructuring reform for military and civil products. It firstly conducted diversified equity transformation for industrial explosives branch, taking the first step in reform of property rights system and diversification of the investment subject. When reform of property right completed, product structure of the company was further improved, and a great progress was made in both production technology and market performance of civil product business of the company. However, development of civil products of LNCC still failed to realize scale economy, with poor developing quality and weak market competitiveness.

For faster development of civil product business and stronger and larger superior products, after working with state-owned, private and foreign companies to establish subsidiaries for

purpose of resource integration, industrial chain perfection and acquisition of advanced management, technology, market and funds since 2005, the company finally achieved diversification of investment subject. Its joint ventures include Sichuan Nitrocell Co., Ltd., Gansu North Santai Chemical Co., Ltd., Luzhou Northdadong Chemical Co., Ltd., Hercules Tianpu Chemicals Company Limited and Sichuan Guifeng Organic Silicon Materials Co., Ltd. Broad cooperation brought fundamental changes to assets structure of the company and helped the company achieving market expansion and resource integration, as well as realization of complementary advantages and win-to-win goal.

Combination of developing process of civil products and property right reform was the result of optimization and adjustment of product structure by the company. In 1980s when orders of military products reduced markedly, the company made a decision to set foot in development and production of civil products of cellulose derivative by taking advantage of its original production technology of military products. After nearly 20 years' efforts, the company obtained huge success in production and sale of cellulose derivatives. At the beginning of 2006, as backward development of DMC industry required large amount of imports to balance supply and demand while foreign DMC industry insisted technology blockade, the company, in combination with its own technical advantages and industrial foundation in methane chloride industry, plus its high-quality and large-scale chlor-alkali products, grasped the opportunity to enter DMC area for expansion and development of downstream products with high technology and added value, as well as formation of chlor-alkali product industrial chain. Restructuring and optimization of civil products played a fundamental role in improvement in industrialization and long-term development of the company.

4.3 Analysis of resources and capacity of case company

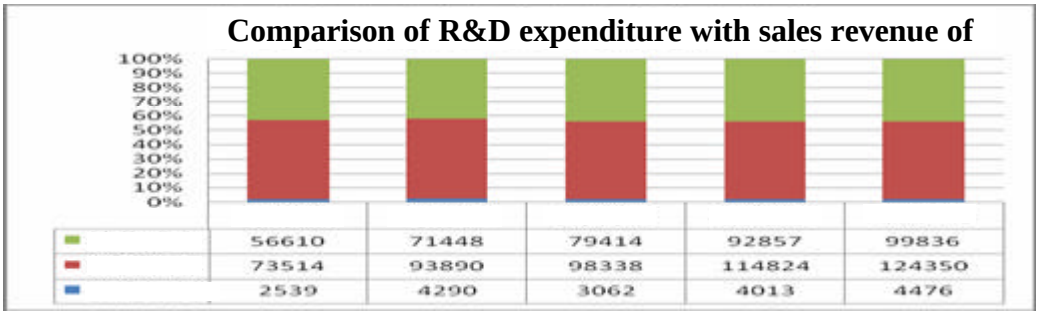
4.3.1 Relevant R&D resources analysis of LNCC

LNCC has a subordinate product R&D center and a science institute, and the former is its major research institute of civil products. The product research center is composed of the following four parts: the first part is an EC production line with annual output of 200 tons; the

second part is a pilot production line containing two teams, wherein, pilot team I takes charge of products pilot test, i.e., conducting amplification experiments and test for technology achievements of study of cooperative universities; while the pilot team II is responsible for application research, acquaintance with customer information and products quality tracking. The third part is in charge of analysis and test, of which the criteria team has national level-2 inspection qualification of caliber and appliance; the last part is primarily engaged in data collection and translation of relevant data, wherein the technology department applied unified patents for the company.

The research center is of provincial technology center and plays a leader in peer R&D centers, responsible for realization of technology industrialization. Currently there are more than 40 people working in the center, most of who are young researchers and dominated by well-educated personnel with advanced degree, supplemented by a number of experienced backbone researchers. The research center is primarily engaged in the study of cellulose ethers products. As the company realizes the importance of new products for a chemical company, it enlarges its R&D investment and establishes cooperative relationship with various universities.

Figure 4-2 Comparison of R&D expenditure with sales revenue of LNCC



Data source: Internal data of LNCC

LNCC almost maintains an input of more than 3% of sales revenue for every year, with the highest of 4% or above, keeping a stable level of R&D input. See Figure 4-2 for relevant information. Despite the level is higher than average level of 1.6% (for 2004) in China, it is lower than the mean level of 3.9% of top ten chemical companies around the world, of which Bayer has the highest of 6.3%. In terms of absolute capital input, level of LNCC lags far behind top ten companies in the world. Dow Corning, whose R&D input level is the lowest in the top ten, has an annual mean input of more than 10,210,000 Euros.

In conclusion, after development of several years and under high attention of the company in overall development strategy, the product R&D center of LNCC has increased R&D investment and achieved great progress and growth in R&D and technical support of cellulose ethers products, becoming a top R&D team in China.

4.3.2 Staffing analysis of LNCC

At present, employees of LNCC totals 5,200 people, including 500 operation managements, 500 engineers and technicians and 4,000 on-site operators. In respect to educational background structure, workers at the production line mainly are high school graduates and secondary graduates or below, while management and technicians are primarily composed of graduates with junior colleges degree or above. Qualities of employees are relatively low on the whole. But in terms of categories, staffing allocation is reasonable for that the proportion of high-quality and highly educated personnel in management is comparable with that in peer companies. Human resource of the company is mainly through external recruitment. Planned recruiting university graduates are 30 to 40 people for each year, principally for reserve of talents. Most of those graduates are majors of professional courses of Nanjing University of Science and Technology, North University of China, Sichuan University, Harbin Institute of Technology and Southwest University of Science and Technology. In addition, the company works with universities to cultivate required personnel, which is helpful for heritage and development of corporate culture.

Besides continuance of unique human resource management model of state-owned companies, the company, through its dependent efforts and exploration, gradually created its

own system of human resource management, which is reflected in the following three aspects.

(1) Employing system: In staffing aspect, the company, based on main principles of promotion of growth of employees, conducts internal reform, under which employees compete for management internally. Recruitment for engineers and technicians depends on talents hunting in external personnel market, supplemented by internal cultivation of technicians. And for workers at production line, the company cooperates with universities for united training. The number of operators hired from vocational colleges totals nearly 170 to 180 every year.

(2) Wage allotment system: The company implemented allotment system of quota wages plus bonus prior to 1999. Since 1999, efficacy was counted in, thus wage was linked with profit and output. Wage composition included 20% of minimum wage for basic living guarantee and 80% of wages linking with performance. Such system was effective till 2007. After 2007, proportion of those two wages was adjusted to fifty-to-fifty, wherein regular wage included annual assessment wage, standard wage, title allowance, confidential allowance, and post wage, and performance pay including high-level backbone talent allowance.

(3) Appraisal system: Appraisal includes two parts: one is appraisal of middle management and leaders of group company led by the nomination committee, including post quantification, economic indicator and personalized assessment. Another is appraisal of management below middle level, skilled personnel and operators by secondary units, which is planned by human resource department.

Under the complete human resource management system, LNCC has achieved good benefits for the company, with the best evidence of double-digit growth of continual nine years. However, certain problems also exist in human resource management of the company, such as talent drainage due to geographic location and personnel structural break for historical reasons, which challenge the company and drive it to search solutions to such problems for better development.

From perspective of overall human resource of LNCC, employing efficiency of the company has been improved till now after adjustment and reform of personnel allocation. Number of total employees of the company has declined to 5000, presenting a relatively stable and reasonable staffing structure and a complete employing system.

4.3.3 Analysis of funding capacity of LNCC

(1) Analysis of own funding capacity of the company

As LNCC is a subordinate to China North Industries Group Corporation and one of national key large-scale military chemical enterprise, it has total assets of 314,170,000 Euros, with sales revenue reaching 126,570,000 Euros in 2009 and the output value of civil products accounting for 92% in total output value, showing a strong funding capacity. Moreover, with rapid development in recent years, net profit of the company remains at a high level.

(2) Financial support by China North Industries Group Corporation

Besides own financial advantages, LNCC also obtains corresponding financial support from its parent company-China North Industries Group Corporation. China North Industries Group Corporation was established in 1999 and has more than 120 subordinate companies integrating R&D, trade and production, with total assets of 16,025,000,000 Euros. For the past few years, the group speeded up its industrial restructuring pace, developed steadily, and kept a promising growth momentum for its main business, ensuring its gross margin staying at a level between 11% and 13%.

(3) State support

The government highly values development of the industrial company producing military products, thus increases investment in such area year by year. As LNCC is a company integrating production of military and civil products, the government gives adequate support to it during its construction process.

(4) Bank credit support

LNCC not only has strong dependent fund raising capacity but also establishes good relationship with banks. It cooperates with Bureau of Finance of Luzhou, Luzhou Xinglu Investment Group Co., Ltd. and Luzhou Laojiao Co., Ltd. to make joint contribution to establish Luzhou City Commercial Bank Co., Ltd., which has strong public funds raising capacity. As a shareholder of such a company, LNCC has a easy access to credit support.

4.3.4 Other resources analysis of LNCC

(1) Profound and unique cooperate culture

For a military product company with a history of nearly 80 years, uniq ue cooperate culture has become an indispensable part of corporate resources, as well as an important source for competitive advantages. LNCC develops its corporate spirit as “exploration & innovation, practicability & efficiency, unity & devotion”, adheres to the principle of “people orientation, honesty & loyalty, pursuit of top quality”, and makes its entrepreneurial vision as “creation of domestic top and international well-known company integrating military and civil products production”, presenting a “Double-five” culture which is the essence and summary of development of 80 years. Under the guidance and leadership of such a culture, the company posses a unified and efficient productivity, as well as an innovative ability. The family-like company focuses on humanistic care for its employees, who create effective results through positive attitude in return. Under impact of such a culture, once the company determines its developing direction, a joint power will form all over the company, so as to make great efforts for a common goal.

(2) Brand effect in chemical industry

The “Double-five” brand of LNCC has won a good reputation among both foreign and domestic customers for its high-quality products and excellent services. Products under “Double-five” brand have good markets in China and are sold to more than 20 countries and regions, rated as satisfactory products of national customers. In terms of both brand popularity and high quality of the brand, “Double-five” means superior quality and service, occupying a certain position in the eyes of users.

4.4 Industrial chain selection of case company

4.4.1 Selection criteria of industrial chain of case company

According to analysis of main business of LNCC, we find that LNCC is in the midst of four industrial chains, i.e., cellulose ester industrial chain, cellulose ether industrial, chloride industrial chain and DMC industrial chain. Further analysis shows that those industrial chains are interlocking rather than independent, for example, methane chloride of the chloride

industrial chain is the feed stock of DMC. For that simultaneous analysis of four industrial chains will impact depth of the research, this thesis selects one industrial chain of LNCC as analytic target. Through and several field research of LNCC and interview with major leaders of the company, we establish the following criteria for selection of analysis target of this thesis:

Firstly, the industrial chain shall have large market capacity, high profitability and promising development outlook;

Secondly, comparable advantages shall exist and superior resources of LNCC shall concentrate in the industrial chain, which will become a developing focus of the company in the future;

Thirdly, industrial data of the chain, data of LNCC, and data of competitors shall be complete and acquirable.

4.4.2 Industrial chain selection of case company

According to selection basis of industrial chain of case company, we conducted analysis on 4 major industrial chains of LNCC and selected cellulose ether industrial chain as the analysis target of the research.

LNCC's cellulose ether industrial chain, now at the third to fourth stage of enterprise development, is a chain underpinning the rapid growth of the company that has taken shape and gradually been improved by explorations and searching efforts at all levels of the company. Mired in successive losses for a decade, the company started reform in 1998 from its distribution system, by grasping available opportunities and focusing on the nitrocotton business, it carved out a path toward coordinated development of military and civilian businesses by 2000. In 2002, LNCC's nitrocotton business was restructured with relevant assets of 845 Factory and went public. After it split the production and operation right of its main operation—nitrocotton business, the company turned to expand the production of cellulose ether products including methylcellulose and hydroxy ethyl cellulose, and finally established the current industrial structure.

4.4.2.1 The cellulose ester industrial chain

Final product in the cellulose ester industrial chain is nitrocellulose produced by Sichuan Nitrocell Co., Ltd. The company has good productivity effect, now is under direct management of CNGC and only has assets relationship with LNCC, hence analysis of this chain is not the focus of industrial chain analysis of LNCC. We will only analyze the developments and status quo of the cellulose ester industrial chain and its contributions to LNCC.

Sichuan Nitrocell Co., Ltd (SNC), subordinate to China North Industries Group Corporation (Norinco Group), specializes in the production of nitrocotton, a cellulose derivative. SNC was incorporated in August 2002 through trans-regional asset restructuring (including the former nitrocotton production line of LNCC), with headquarters in Luzhou, Sichuan Province and production bases across Luzhou, Xi'an, Shannxi Province, Taihe, Jiangsu Province, and has a controlling stake in Jiangxi Luqing Nitrocell Co., Ltd and Guangzhou Beihua Kaiming Trade Co., Ltd. In September 2005, the company is incorporated as a joint stock company, and became a listed company (stock name "SNC Share", code: 002246) in June 2008. It has become one of the largest nitrocotton producers in the world, and operates in the cellulose derivatives sector by leveraging its financing strength in capital markets. The company, now one of the three executive members of Worldwide Nitrocellulose Producers Association (WONIPA), is the only domestic enterprise that can rival international nitrocotton giants.

Industrial nitrocellulose is primarily applied in the production of nitrocellulose lacquer, printing ink, adhesives, harness oil, nail polish, table tennis balls and celluloid ornaments. The company possesses state-of-the-art techniques, scientific testing methods and a full range of varieties. With an efficient, multi-functional and comprehensive network integrating production, marketing, R&D and after-sale services, the company's production, quality, service and benefits have been significantly improved. Products under its brands including "SNC", "NICELO" and "JUSFIT" sell very well in more than 30 countries and regions across the world. Its has been named as "Excellent Supplier" by Lanxess (formerly known as Bayer Chemicals Corporation) for three consecutive years, rated as excellent supplier and model supplier by AkzoNobel from time to time, and also the exclusive supplier of "Double Happiness", a famous sports apparatus supplier and the table tennis brand "Pisces". It now dominates 42.6% of the domestic market of the industry and accounts for 18% of the international market, establishing itself as a market leader in global nitrocellulose industry.

Since its incorporation, SNC has delivered remarkable operating results with its total

profit hit 643,000 Euros by 2007, and as quality assets independent of LNCC, it went public in 2008. On year on since its listing, SNC smoothly transformed itself in 2009. As output and sales continue to expand and operating revenue increases steadily, the company shows good growth momentum.

Table 4-1 Financials of Sichuan Nitrocell Co., Ltd 2006–2009

Item	2006	2007	2008	2009
Total operating revenue (1 million Euro)	5.5	5.8	5.5	5.7
Total assets (1 million Euro)	4.2	4.6	6.5	6.8
Total profit (1 million Euro)	0.61	0.64	0.33	0.22
Increase in operating revenue	6.92%	5.84%	-4.80%	4.64%
Increase in operating profit	38.67%	-7.33%	-47.01%	-44.21%
Change in gross margin	26.86%	25.20%	19.37%	19.89%

Data source: Internal data of LNCC

Table 4-2 Financials of SNC

Item	Output (Ton)	Increase in output (%)	Sales volume (Ton)	Increase in sales (%)	Operating revenue (1,000 Euro)	Increase in operating revenue	Total profit (1,000 Euro)	Increase in profit (%)	Return on net assets	Return on assets
2008	39,287	-20.36	39,333	-18.35	5,552.56	-4.80	332.45	-49.05	6.34	6.58
2009	44,433	13.10	44,723	13.70	5,810.49	4.64	227.82	-31.47	3.67	3.20

Data source: Internal data of LNCC

Currently, SNC delivers stable investment returns for the Group and is an important source of funds for LNCC. The good performance of SNC clearly demonstrates that it is feasible to

strip quality assets and get it listed. As the first listed company in the cellulose industry, it has provided a favorable platform for the development of the whole cellulose industrial chain of LNCC and paved the road for the establishment of a cellulose industry platform required by Norinco Group.

It is worth noting that the ongoing stripping and listing of quality assets has certain negative impacts on LNCC. The cellulose industrial chain is a core business of LNCC, its stripping and listing will leave LNCC lost its core, which will probably lead to loss of its status as a military enterprise. Under such circumstances, LNCC should, taking diversification strategy as is guideline, plan its future development by identifying new growth point that combines military and civilian needs and developing new industry chains. Only in this way can the core competitiveness of LNCC be increasingly enhanced and steady growth of the Group facilitated.

4.4.2.2 The chloride industrial chain

Final products of chloride industrial chain include methane chloride, chloroacetic acid and chlorinated PP; of which, methane chloride produced by LNCC is primarily used as feedstock for MC production; output of chloroacetic acid is low and relevant process is outdated, thus only a small quantity of chloroacetic acid are used to produce CMC. Therefore, with increasing output of CMC, chloroacetic acid will be used as feedstock for production; production of chlorinated PP started in 2006, and for advanced technology and good performance, this business has a promising development. However, because production history is short, we can only acquire limited data. Considering the above reasons, chloride industrial chain cannot be the major chain for analysis of LNCC.

4.4.2.3 The DMC industrial chain

DMC industrial chain is a newly developed industrial chain. Purposes of development of the industrial chain include the following three: the first is that the company has basis for production of methane chloride which is one of feedstock. The second is that DMC has high added value in derivatives industry of the chlor-alkali. The last is that domestic demand for DMC is huge. However, most high-end DMC depend on import, and there are large amount of low-end DMC producers with overcapacity, few of which are capable of producing high-end

DMC. LNCC has obvious technical advantages in methane chloride industry, therefore it has a great opportunity to achieve success. Nevertheless, production of DMC of LNCC was planned till 2006 and started in 2009, giving rise to great uncertainties in respect to production and sale which cannot be analyzed and avoided through production and sale data for the late two or three years.

In terms of products, DMC production of LNCC still focuses on primary monomer. Products put into trial production in 2009 mainly include organosilicon monomer and organosilicon intermediates, and only silicon rubber for silicone products. Products including silicon oil, secondary products, silicone resin and silane coupling agents are not covered, and derivatives further downstream are yet to be developed. In a nutshell, the DMC industrial chain is still at the stage of trial production for primary products with low value-added, which may be illustrated by an average cost for monomers of 1653.75 Euros/ton with an average price of 1732.04 Euros/ton in 2009.

In terms of technology, the major technologies for DMC production in LNCC need to be improved. The DMC production line of LNCC is primarily supported by technologies provided by China BlueStar Chengrand Research Institute of Chemical Industry, which also is the primary provider of synthesis technology since it possesses key synthesis techniques. While in terms of product technology, Wuhan University, Qingdao University of Science & Technology and Hangzhou Normal University are also engaged in research of organosilicon products, but currently no major breakthrough has been made in application technologies. Hangzhou Normal University has a national laboratory for silicofluoric materials, with which LNCC is now negotiating the possible joint establishment of a production and research center that devoted to R&D of key products and technologies and the development of downstream products. In general, the DMC industry of LNCC is at its early stage of development, which necessitates further breakthroughs in a number of technologies to better and step up technological progress, so as to acquire an advantageous position through exerting internal efforts and depending on external achievements in scientific research.

In terms of scientific research on DMC, LNCC has never slackened it space. Considerable efforts of the its scientific research center, which is a provincial-level technological center at leading position among domestic R&D centers, are put into the R&D of organosilicon products. The research center has more than 40 staff, most of which are young personnel and graduates from key higher education institutions, others are experienced engineers. The center assigned a

dozen or so backbone technical personnel for the DMC development project. Currently major technologies required by organosilicon monomer production have been largely acquired. Though the company input a number of personnel into the R&D of DMC, it still is unable to meet the demand for R&D force. In particular, the overall R&D level of downstream products at present is lagging behind those of leading countries worldwide.

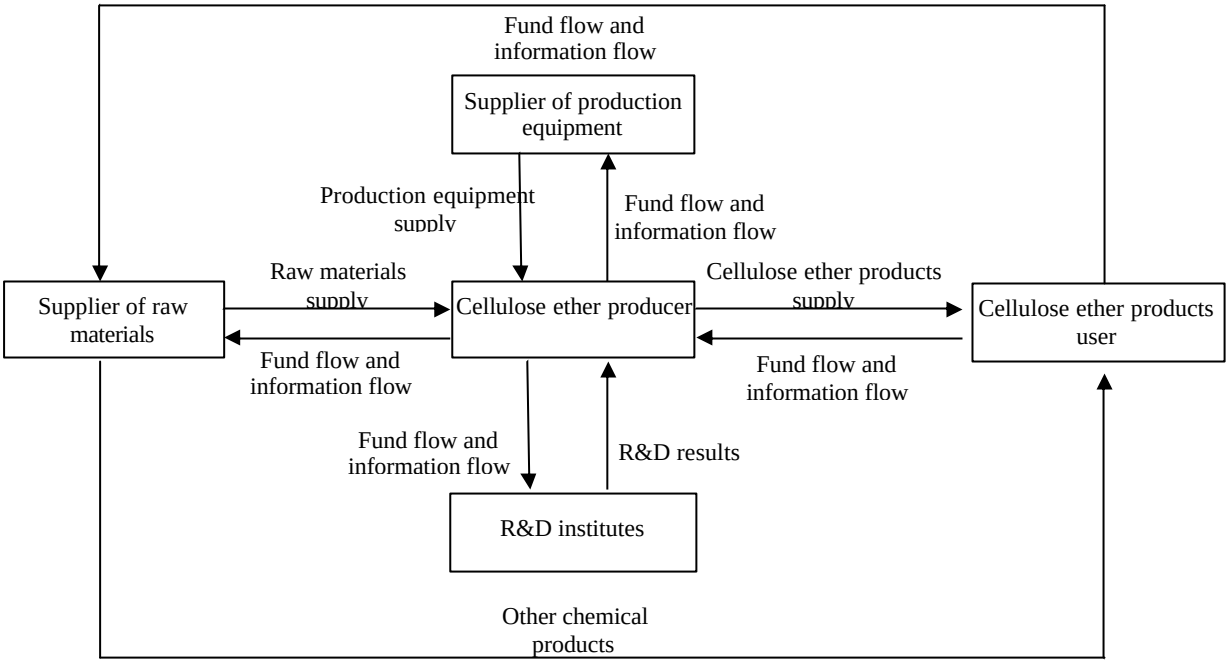
In terms of the funding of DMC project, LNCC plans to input 70,836,267.88 Euros into its DMC production line with a designed capacity of 100000 ton/a, of which 61,240,000 Euros has been disbursed by completion of Phase I project. It is expected that an additional 40,830,000 Euros needed to be invested to complete the construction of Phase II, and according to LNCC's share, a total of 71,450,000 Euros needs to be invested. Currently, its main channels of financing include its self-raised funds, as well as other methods including bank credit, state support, reducing stakes and joint venture. Given that this project is both military and civilian and gets adequate support internationally, during the construction of Phase I project, 8,570,000 Euros has been received from the Commission of Science, Technology and Industry for National Defense, and another 3,060,000 Euros is also acquired for Phase II project. The Norinco Group will also fund this project. Overall, currently the total capital input in the DMC project is enough to enable the operation of the whole project.

It can be concluded from the above analysis that the DMC industrial chain is still in its infancy and great uncertainties still exist. Therefore, although LNCC chose DMC industrial as its major chain, and the chain has most superior resources of the company, it cannot be the major target of industrial chain analysis.

4.4.2.4 The cellulose ether industrial chain

At last, we'll look at the cellulose ether industrial chain. The cellulose ether industrial chain involves such participants as suppliers of upstream raw materials and production equipment, cellulose ether products producers and downstream users, as well as chemical partial research institutes engaging in R&D of chemical products in the chain. See Figure 4-3 for details of cellulose ether industrial chain:

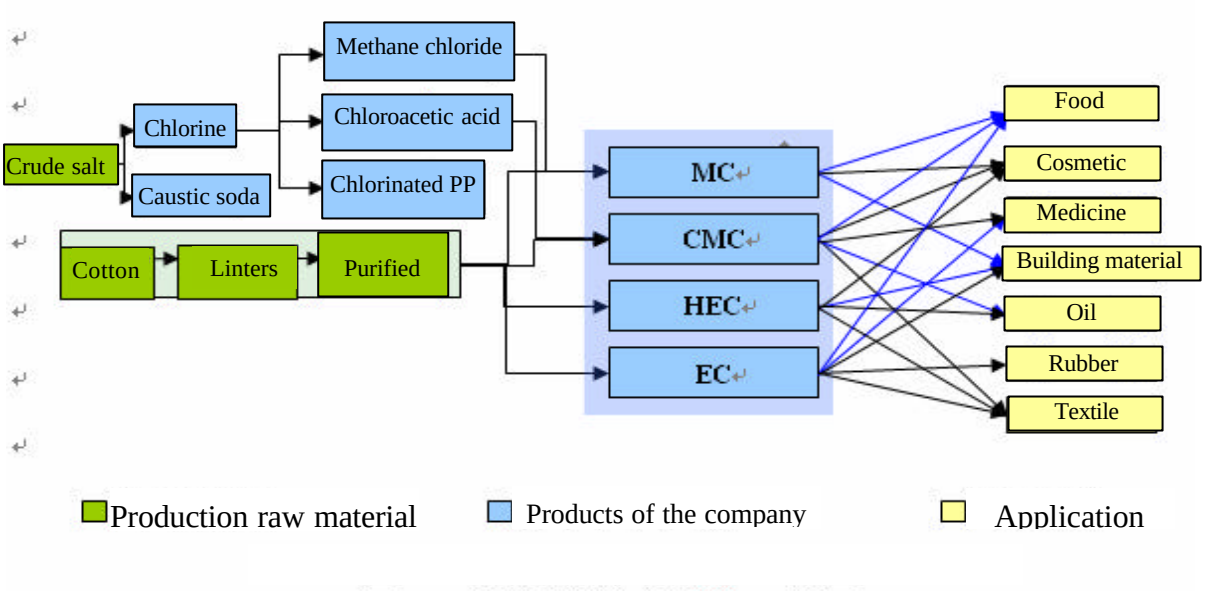
Figure 4-3 Cellulose ether industrial chain



LNCC engages in production of major cellulose ether products in upstream industrial chain. In particular, major cellulose ether products of LNCC include MC, CMC, HEC and EC. At present, except for EC production which is conducted by R&D center of LNCC, the rest three products are produced through cooperation with other companies, for which joint ventures are founded. Among those products, Tianpu Chemical Co., Ltd. is responsible for MC production while Luzhou Qiaofeng for CMC production and Dadong Co., Ltd. for HEC production. Therefore, those four products of LNCC can be considered as for strategic business units (SBU) of the company (Hitt, 2009). Hence strategy selection of LNCC shall be conducted on basis of strategic analysis of each SBU.

In upstream raw materials, purified cotton is the most important raw material for production of cellulose ethers. LNCC mainly obtained such raw materials through procurement, while another two important raw materials like methane chloride and chloroactic acid are primarily supplied by products in chloride industrial chain of LNCC. In other words, partial final products in chloride industrial chain are raw materials of cellulose ether industrial chain. See Figure 4-4 for cellulose ether industrial chain of LNCC:

Figure 4-4 Cellulose ether industrial chain of LNCC



Major cellulose ether products of LNCC include MC, CMC, HEC and EC. MC is mainly used as additives in such fields as mortar for water conservancy, building materials, environmental protection, pharmaceuticals, PVC, food and cosmetics. CMC has the largest output, and is the most widely used and convenient among all cellulose ether products, also known as “industrial monosodium”. CMC can form high-viscosity colloid and solution, and is characterized by adhesion, thickening, fluidity, emulsion dispersion, shaping, water conservation, colloid protection, film molding, acid resistance, salt tolerance, suspension and other features, without any physiological hazards. Therefore it is widely used in such fields as food, pharmaceuticals, daily chemical products, petroleum, papermaking, textiles, and buildings and so forth. HEC is mainly used as addictives for emulsion paint (environment-friendly water-based paint), cosmetics, consumer goods, oil drilling (though widely used in foreign countries, it is still not widely applied domestically to save costs and is only for special oil fields) and medicine (difficult to enter due to high entrance barriers). Currently at the product-to-market stage, HEC has considerable profit margin. EC products are mainly used as additives for resin synthetic plastics, coating, rubber substitutes, printing ink and insulation materials, and as adhesives as well as textile finishing agent.

LNCC plays a leading role in production and sale of MC, and major profits of the company are from MC business. In 2006, after joint venture of LNCC with American Hercules (fifty to fifty), the company obtained a further improvement in both production and sale of MC. CMC is

one of the earliest products of LNCC with long production history and complete data. Current CMC production equipment of LNCC is outdated with high energy consumption. In addition, CMC production technology has been mastered by many domestic companies at present, resulting in overcapacity of CMC, fierce competition and low margin. However, currently LNCC has implemented improvements in CMC production equipment by using relevant resources, making expansion project of CMC production one of major projects of the company. HEC products of LNCC were produced since 2005. Relevant production technology and process is in a leading position in China. But current production capacity is low and such problems as mismatch of existing production equipment and product performance also exist. For few HEC producers in China and huge market demand, LNCC inputs its most superior resources in R&D and technology upgrading of the product, with a broad development space in the future. Added value of EC product is the highest among cellulose ether products. EC product of LNCC occupies the top position in EC market in terms of process technology and market share. But due to small demand for EC product in the market, LNCC does not choose EC product as its focus. The thesis conducts SWOT analysis of LNCC's cellulose ether industrial chain and the results are showed in the following Table 4-3:

Table 4-3 SWOT analysis of LNCC's cellulose ether industrial chain

Internal strength	**Internal weakness**
1. As the core business of LNCC, the industrial chain is subject to operating management by LNCC and receives various kinds of supports from LNCC such as capital support, technology support and personnel support. 2. LNCC has a long history of fiber product manufacturing and the industrial chain is highly mature: mature process and technology, skilled staff, complete and stable production and sales chain, and	1. Weak product R&D capability. Although LNCC has cellulose technical center, the center focuses on improvement of the existing patents and lacks research on new products. 2. Due to fierce market competition, LNCC is still in a weak position compared with international peers in terms of technology and product quality.

Internal strength	Internal weakness
suppliers and customers with long-term cooperation relationship 3. Production and technical capacities reach domestically-advanced level; some products are competitive and take the leading position in the industry.	
External opportunity	**External threat**
1. Since financial crisis, China has showed a sound economic situation; relevant industries have experienced steady development and the market demand is large. 2. The issuance of *Plans for Adjusting and Accelerating the Petrochemical Industry* has provided a sound external platform for development of LNCC's cellulose industrial chain. 3. Products can be widely used, the application fields are increasingly expanded and the industry develops rapidly.	1. Industry competition will become fiercer with foreign enterprises like Dow Group and Hercules entering domestic market, resulting in increasingly lower product profit. 2. As the government pays more attention to environmental protection, the process of old technology elimination will be accelerated, resulting in rising production cost. 3. China lags behind some foreign countries as to cellulose technology, so LNCC is not strong enough to compete with foreign enterprises.

In conclusion, the most important industrial chain of LNCC is cellulose ether industrial chain. The company concentrates its main business in the chain, and input its most superior resources in it, plus long production history of the chain, we can acquire complete data of the chain. In combination with determined selection criteria, we finally choose the cellulose ether industrial chain of LNCC as our research object.

Chapter 5: Analysis

Following the research approach of this study, the case study first explores the major factors affecting strategic decisions of Luzhou North Chemical Industry Co., Ltd. (LNCC), then analyzes the competitiveness of variious products of LNCC on the cellulose ether industry chain based on the abovementiond factors, and finally provides decision-making support for strategic choice of LNCC in light of relevant theories and conclusions. Therefore, case study in this section will also follow the this approach.

5.1 Factor analysis based on influence exerted by industrial chain on strategy choice of the case company

Strategy choice is always based on comparative assessment of a range of influencing factors and comparison between different factors to determine their significance of impact on strategic decision. When various influencing factors exist, how to select key factors scientifically becomes the first issue in need of solution. Currently, there are many assessment methods for factors, of which analytic hierarchy process, precedence chart and multiple-input weighted precedence chart are the most widely used (Hitt, 2009). Though able to be used for ordering of influencing factors, analytic hierarchy process is mainly applied to choice of specific plans. Precedence chart is the basic process for analysis of significance of factors, but it becomes cumbersome in event of collective decision. Multiple-input weighted precedence chart is the major method adopted in the thesis for ordering of influencing factors. Though this method is developed based on Precedence Chart, collective decisions solved by it are complicated issues of Precedence Chart. The method allows several management staffs of the enterprise to be engaged in factor grading to reduce grading errors.

When multiple-input weighted precedence chart is applied, the following matters shall be taken into consideration (Hitt, 2008):

1. As there are various factors that affect a certain target or phenomena, it is necessary to leave out insignificant factors and combine similar factors together to make the precedence chare concise.

2. In the course of in-pair comparison of factors, experts involved in assessment shall keep their own independence and try to not be influenced by authorities. In event of any authoritative factors found to affect objective assessment in the process of research, researchers shall take appropriate measures to handle it to reduce errors to the greatest extent.

3. As there are many people engaged in application of multiple-input weighted precedence chart, and a large volume of data to be processed, which may result in figure error or form filling mistakes, inspection is required. There are two inspection methods: sum inspection and complementary inspection. Sum inspection: judge whether the precedence chart is correct or not by means of inspection on total amount on the right. Inspection formula is $T=n(n-1)m/2$, of which, n means number of comparison object and T refers to aggregation of all lines. Complementary inspection: set the diagonal line of the precedence chart as the symmetry axis and compare and contrast figures in symmetric blanks on both sides of the symmetry axis. If sum of figures in the two symmetric columns is equal to number of experts, figures filled in precedence chart will be judged to be correct.

So far, a number of scholars have studied the determinants of strategy choice of manufacturing enterprises, for example, Chai (2000), from the perspective of market analysis, argued that the value addition potential of products, market competition, market share and market demand are the major factors determining strategic decision-making of manufacturing enterprises; Chen (2002), emphasizing technology, considered that an enterprise's technical strength and its scientific research capability are the major competences for a manufacturing enterprise; Wei (2004), through research on domestic state-owned enterprises, found that policies of group company play an important role in strategy choice of state-owned enterprises. Lin (2006) and Liu (2001) held that employee's quality, enterprise's management capability and financial position also, to an extent, affect the strategic decision-making of manufacturing enterprises.

For factors that might affect LNCC's strategic choice related to cellulose ether industrial

chain, we invited 6 management staffs of LNCC for discussion. The basic pattern of Focus Group (Laws, 2003) was introduced in the course of disscussion, i.e. first of all explain to the participants that the discussion is not for the purpose of consensus, encourage the participants to feel free to express their own opinions and ask the participants whether they have any supplements after the discussion. Based on the discussion results related to factors affecting strategic choice of the manufacturing enterprises and in combination with discussion materials from management staffs of LNCC, we select these six influencing factors emphasized in the course of strategic decision making, namely, value growth, market potential, competitive intensity, technical level, scientific research competency and policy of group company. The Focus Group pattern applied in the discussion together with relevant conclusions of theoretical research can not only fully dig real information of LNCC but also ensure a solid theoretical basis of the thesis.

We made a precedence chart for these six factors above and invited six management staffs who have been engaged in management in this company for more than three years to grade each influencing factor (**please refer to Appendix 2 for list of participants of gradation**). Specific gradation process is as follows:

Firstly, we put these six management staffs together through appointment and coordination and ensure that each person will not be interfered by the Company's affairs during the whole gradation process;

Next, we tell them the grading method for precedence chart, namely, compare these factors in pairs, select the factor which you consider more significant and give it one point and zero for another;

After that, we simulate a investment decision scenario for them, namely, investment on a strategic business unit (SBU) (ex. MC) of cellulose ether industrial chain of LNCC is required, and they are asked to grade each factor in accordance with the precedence chart provided by us.

Then, we collect and summarize the scores given by each management staff and fill the scores into the blank space of multiple-input weighted precedence chart.

Finally, carry out sum inspection and complementary inspection for multiple-input weighted precedence chart. In accordance with sum inspection formula, the final score is:

T=n(n-1)m/2=6(6-1)6/2=90. Complementary inspection is to inspect whether total scores in the symmetric blanks on both sides of diagonal line of precedence chart are equal to number of participants of gradation, namely, total scores shall be 6.

As per the process above, we carry out multiple-input weighted precedence chart grading for the four SUBs of cellulose ether industrial chain of LNCC. Specific scores are shown in table 5-1 to table 5-5 as follows:

Table 5-1 Score of influencing factors of MC strategic decision

Comparison object	S/N	I	II	III	IV	V	VI	Total
Value growth	I		4	5	5	5	2	21
Market potential	II	2		2	2	4	1	11
Competitive intensity	III	1	4		1	2	0	8
Technical level	IV	1	4	5		5	2	17
Scientific research competency	V	1	2	4	1		1	9
Policy of group company	VI	4	5	6	4	5		24
?								90

Table 5-2 Score of influencing factors of CMC strategic decision

Comparison object	S/N	I	II	III	IV	V	VI	Total
Value growth	I		3	2	3	5	1	14
Market potential	II	3		2	4	4	2	15
Competitive intensity	III	4	4		4	4	1	17
Technical level	IV	3	2	2		3	2	12
Scientific research competency	V	1	2	2	3		1	9
Policy of group company	VI	5	4	5	4	5		23
?								90

Table 5-3 Score of influencing factors of EC strategic decision

Comparison object	S/N	I	II	III	IV	V	VI	Total
Value growth	I		2	5	4	3	2	16
Market potential	II	4		4	3	3	2	16+①
Competitive intensity	III	1	2		0	2	0	5
Technical level	IV	2	3	6		4	4	19
Scientific research competency	V	3	3	4	2		2	14
Policy of group company	VI	4	4	6	2	4		20
?								90

①: In the course of influencing factor grading of EC strategic decision, it was found that score of market demand is equal to that of value growth, therefore we listed these two factors separately to identify their impact degree and then made the management staffs grade them. Their scores are shown as Table 5-4:

Table 5-4 Scores of EC value growth and market potential

Comparison object	S/N	I	II
Value growth	I		2
Market potential	II	4	

Based on independent grading of these two factors, it can be found that market demand exerts more impact on EC strategic decision. Therefore, 16+ is adopted in multiple-input weighted precedence chart to distinguish between them.

Table 5-5 Score of influencing factors of HEC strategic decision

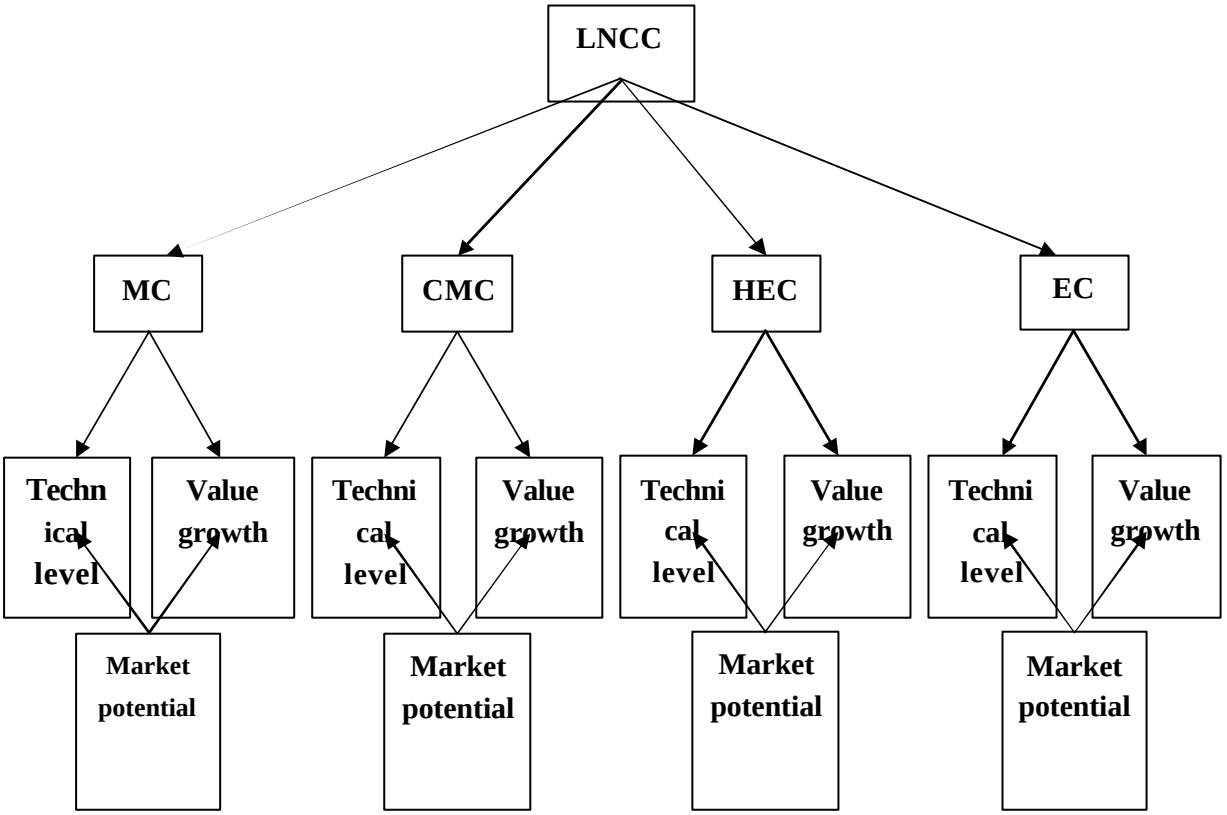
Comparison object	S/N	I	II	III	IV	V	VI	Total
Value growth	I		2	4	3	4	3	16
Market potential	II	4		6	3	5	1	19
Competitive intensity	III	2	0		1	3	1	7
Technical level	IV	3	3	5		5	2	18
Scientific research competency	V	2	1	3	1		1	8
Policy of group company	VI	3	5	5	4	5		22
?								90

It can be seen from the tables above that policy of group company ranks first among influencing factors of strategic decision of the four SBUs, complying with characteristics of domestic enterprises (Wei, 2004). During the period of planned economy, management direction of domestic enterprises was allocated in accordance with relevant national plans and the enterprises didn't have any autonomous right to strategic decision. After the reform and opening up, China entered into the stage of market-oriented economy and state-owned enterprises gained a part of autonomous right to decision due to this economic system reform. But in fact, most state-owned large enterprises, especially those in the sectors tightly related to national economy and the people's livelihood, are strictly controlled by the government. From choice of development strategy of an enterprise to its financial estimates, they shall not be implemented until relevant government departments approve. LNCC is a state-owned military chemical enterprise and is intensively monitored and controlled by the state, therefore management staffs of LNCC consider that it is practical that policy of group company is the major factor affecting its strategy choice. However, with further impact of market-oriented economy, the government gradually relaxes its grip on civil product line of military chemical enterprise and some state-owned enterprises actually have had the right to strategic choice of civil product. Therefore, we consider that impact exerted by inertia of management decision mainly accounts for score of policy of group company ranking first among all factors (Christensen, 1991). In other words, strategic choice of LNCC has been significantly affected by policy of group company for a long term, therefore, this factor is still deemed as a major one affecting strategic choice even though the group company relaxed its grid on it.

Next, without regard to impact of policy of group company, we analyze order of influencing factors of strategic decision of each SBUs. The top three influencing factors of MC strategic decision are value growth, technical level and market potential; that of CMC strategic decision are competitive intensity, market potential and value growth; that of EC strategic decision are technical level, market potential and value growth; that of HEC strategic decision are technical level, market potential and value growth. In conclusion, we can find that technical level (T), value growth (V) and market potential (P) are the most significant influencing factors for strategic choice of LNCC. Based on further classification, it can be found that technical

level and value growth, with certain flexibility, are two variables closely related to the enterprise's development level and their features will be affected by development condition of the enterprise. And market potential has little to do with the enterprise's development and its characteristics are influenced by overall market conditions rather than the enterprise's development, with certain rigidity. Based on this, we consider that strategic choice of LNCC can be based on the following model as shown in Figure 5-1.

Figure 5-1 Analytical mode of strategic choice of LNCC



5.2 Analysis of key products in the cellulose ether industrial chain of case company

We find the major influencing factors of strategic choice of LNCC and establish an analytical mode for strategic choice by grading the factors affecting the strategic choice of key products in cellulose ether industrial chain of LNCC. Next, based on the analytical mode above, we will analyze the key products in cellulose ether industrial chain of LNCC from the perspectives of technical level, value growth and market potential.

5.2.1 Analysis of value growth of key products in cellulose ether industrial chain

Computing methods of major parameters analyzed in this part are as follows:

(1). Product value growth= sale price of product—cost of sales;

(2). Sale price of product=gross sales of product/sales volume of product;

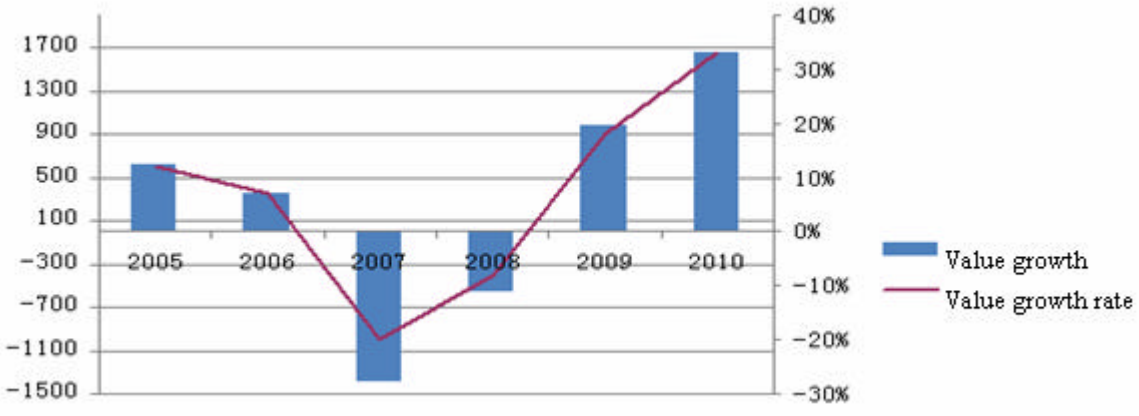
(3). Cost of sales=cost of raw material (including procurement cost)+ labor cost+ equipment depreciation cost+ marketing expense

Next, based on these three calculation formulas, in combination of financial data provided by LNCC, we will analyze value growth of four products in cellulose ether industrial chain respectively.

5.2.1.1. Analysis of EC value growth

In accordance with data from 2005 to 2011 (Figure 5-2), we can find that EC value growth fluctuated greatly during this period. In 2005 and 2006, EC value growth was positive and great. In 2007 and 2008, EC Product underwent a relative big loss due to substantial price rise of raw materials of EC. In 2009 and 2010, as price of raw materials restored to normal level, EC Product achieved favorable value growth. Based on the whole timeline, we find that EC value growth of LNCC is relatively great and its growth rate is relatively high. Therefore, EC Product is considered to be of relatively high value growth and denoted as V^H Product.

Figure 5-2 EC value growth of LNCC from 2005 to 2010 (Unit: Euro/t)

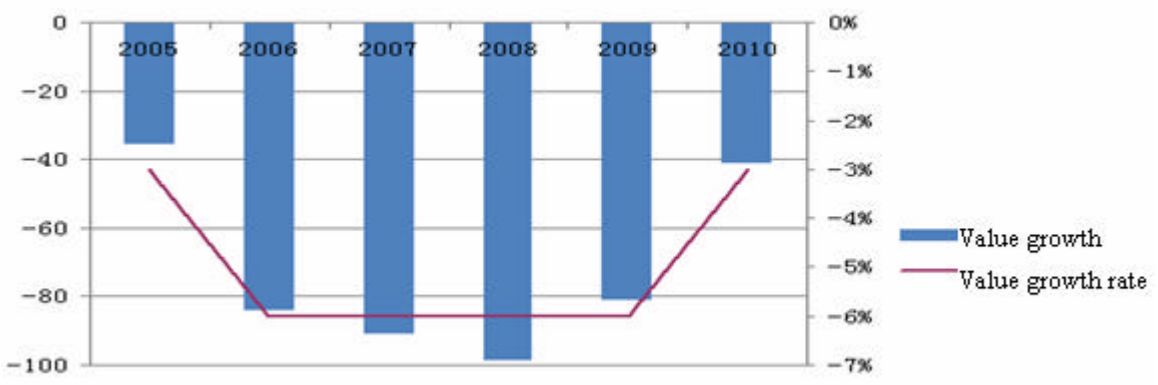


Data source: internal data of LNCC

5.2.1.2. Analysis of CMC value growth

As shown in Figure 5.3, sales cost of CMC has always been higher than its sale price over years and CMC product is in deficit. The reason why we continue to produce CMC so far is that: CMC is in the chemical industry with high exiting barrier and total amount of equipment invested by LNCC on CMC production is large; in addition, it can be found from the figure below that CMC's unit loss is not large though it is always in deficit, therefore continual production is a better choice compared to existing cost. In accordance with analysis of CMC value growth, CMC Product of LNCC is considered to be of low value growth and denoted as V^L Product.

Figure 5-3 CMC value growth of LNCC from 2005 to 2010 (Unit: Euro/t)

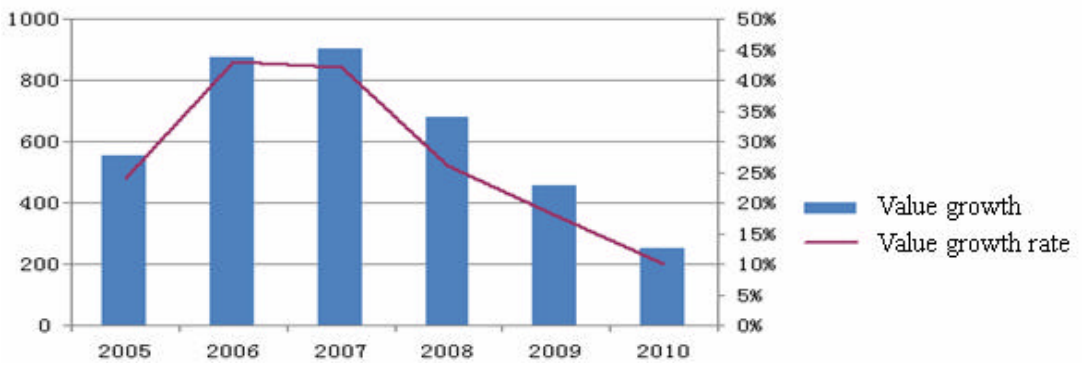


Data source: internal data of LNCC

5.2.1.3. Analysis of MC value growth

In general, value growth of MC basically maintains a relatively stable level without any great fluctuation. As shown in Fig. 5.4, Thought value growth and its growth rate of MC declined since 2008, value growth of MC is considered to be relatively high based on specific value of value growth. Therefore, MC Products are considered to be of high value growth and denoted as V^H Products.

Figure 5-4 MC value growth of LNCC from 2005 to 2010 (Unit: Euro/t)

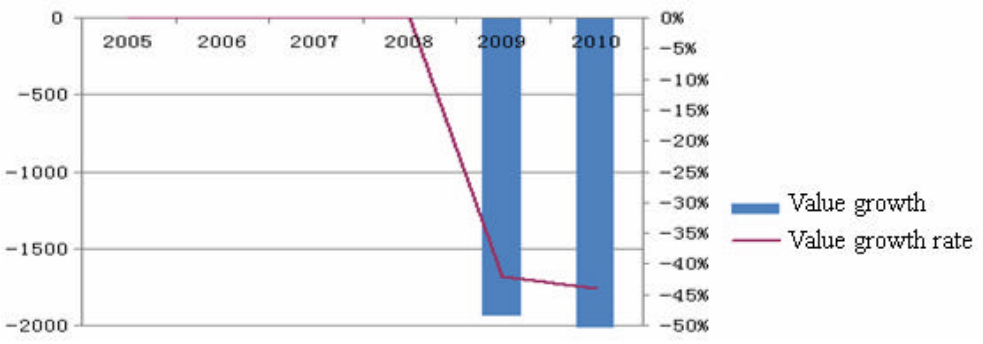


Data source: internal data of LNCC

5.2.1.4. Analysis of HEC value growth

As LNCC began to produce HEC Products in 2009, we can only carry out analysis with the help of data of 2009 and 2010. As shown in Figure 5.5, HEC presents a obvious loss. There are tow reasons resulting in this situation: first, LNCC is only just involved in production and marketing of HEC Products, which results in higher production cost and lower sale price and then gives rise to loss; second, as wear and tear cost of equipment is included in computing formula of sales cost, procurement cost and wear and tear cost of HEC Production equipment take a large share of sales cost, which leads to significant loss of data. However, generally, HEC value growth of LNCC is relatively low, therefore, HEC Products of LNCC are considered to be of low value growth and denoted as V^{L-} Products.

Figure 5-5 HEC value growth of LNCC from 2005 to 2010 (Unit: Euro/t)



Data source: Internal data of LNCC

5.2.1.5. Analyzing the value growth of major products in cellulose ether industrial chain based on cross-sectional data of 2010

To reflect the value growth of each product in cellulose ether industrial chain of LNCC

more directly and visually, we implement further analysis based on production and sales data of each product in 2010. In the course of analysis, we leave out labor cost and wear and tear expense of machine to study the value growth process from raw materials to cellulose products in the industrial chain.

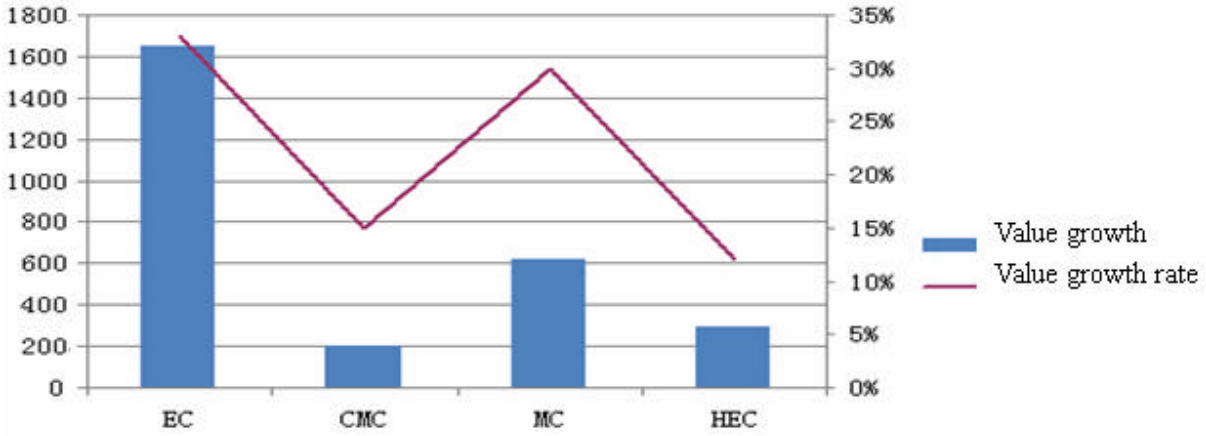
Specific computing formula is :

Sales cost=price of raw material A*consumption volume+ price of raw material A*consumption volume+ price of raw material A* consumption volume+…+price of raw material M* consumption volume;

Sales price= total sales/total sales volume

It can be found from Figure 5.6 that EC and MC are V^H Products; CMC and HEC are V^L Products. This is identical with the analytical results based on time sequence.

Figure 5-6 Value growth of major cellulose ether products of LNCC in 2010 (Unit: Euro/t)



Data source: Internal data of LNCC

5.2.2 Analysis of technical capacity of key products in cellulose ether industrial chain

Cellulose ether industrial chain is one of major industrial chains of LNCC and has a long history of technical development (see Table 5-6 for detailed information), therefore, technical developers of LNCC have a better understanding of technical background, technical application and technical position in the sector of key products in cellulose ether industrial chain. Analysis of technical competence of key cellulose ether products of LNCC is based on interview information from technicians of LNCC.

Table 5-6 Technology development history of key products of LNCC cellulose ether industry chain

Product name	Development time	Relationship between the development background motivation and the leading products	Development approach
EC	1998	Before 1997, the Plant could only produce high and medium-viscosity EC products. The product viscosity range is as follows: high viscosity: 100-120mpa.s; medium viscosity: 40-100mpa.s; no products with the viscosity below 15mpa.s. were produced. In 1997, the Plant was approved to carry out the "Research test of EC with special low viscosity" project; this project passed the factory technology appraisal on June 18, 1998.	Independent development
CMC	1979	In 1979, Workshop 1 applied the ethyl cellulose production line to trial-produce CMC products. In October 1979, a production line with an annual output of 600 tons was built to trial-produce mainly the low-grade products (such as SY-5 products) supplemented by high-grade products (such as SP and FZ products). In October 1980, the Plant agreed to finalize the production. In 1981, due to the needs of foreign trade, Workshop 1 and Workshop 3 worked together and successfully trial-produced the low-viscosity CMC for petroleum, which was then exported to Singapore. In the same year, the toothpaste-type CMC was successfully trial-produced and supplied to the market. Expansion of the solvent CMC production line began in 1982. This line was completed and put into production in 1983. The instant CMC (SR type) was successfully trial produced and placed on the market in 1984. In 1980, Workshop 3 put together part of the military production line equipment and workshops into a aqueous-medium CMC production line. CMC (grade: XYF type) products manufactured by aqueous medium process were mainly used for synthetic detergent and drilling mud. After further expansion, its production	Independent development

Product name	Development time	Relationship between the development background motivation and the leading products	Development approach
		capacity had reached 700 t/a by 1985. 1,091 tons of aqueous-medium CMC (XYF) were exported between 1981 and 1985. The development of food-grade CMC began in 1983. The health permit was obtained from the municipal epidemic prevention station in 1985. The batch trial production began in April 1986. CMC (SY-7) products were successfully developed in 1993. Such products were mainly used for Taking-off and landing dehydration operation in the oil well drilling mud. On December 22, 1993, medical carboxymethyl starch (CMS) passed the factory technology appraisal. Construction design for the polyanionic cellulose (PAC) project was conducted in 1992. The project construction was completed in October 1994. In July 1998, the PAC production line was completed and accepted by the Plant. After more than 30 years of development, the Company now has two production lines with the total production capacity of 6,500 tons. Line 1 was built in the early 1980s and had a production capacity of 1,000t/a. Its production capacity increased to 2,500t/a after technological transformation in 2005. It can produce both food-grade and industrial-grade products. Line 2 was built in the late 1990s and was capable of producing 4,000t/a of food-grade products.	
MC	1996	In 1992, the MC series project of Plant 255 was approved. In December 1993, the Development and Design Institute of Southwest Chemical Research Institute under Ministry of Chemical Industry completed the *Preliminary Design for 1,400t/a MC and Derivative Project of LNCC*. The construction started in 1996.	Combination of independent development and technology introduction

Product name	Development time	Relationship between the development background motivation and the leading products	Development approach
		By March 1999, the project was basically completed and put into trial production. In November 2001, the MC and Derivative Project successfully passed the review of the completion acceptance inspection team of Third Division of China North Industries Group Corporation. In 2000, the Company built a 1400-ton production line by applying its independently developed solvent slurry process. Its production capacity reached 741 tons by 2002. The 1400-ton production line was immediately reconstructed and expanded according to the market demand in a later time. The production capacity could reach 2,300 tons after the expansion. In 2005, by using its proprietary technological achievements of MC, the Company worked with Feixiang Group of Companies and together built a 3,000t/a production line. Such line was the largest among all production lines in China at that time. In 2007, the Company worked with Hercules (a U.S. company, which is the world-renowned cellulose ether manufacturer) and together built a production line with the production capacity of 10,000t/a. Hence, the total annual production capacity of the three production lines had reached 15,300 tons.	
HEC	2004	On December 25, 1997, the HEC production technology self-explored by the former second research institute passed the technical appraisal of small test of the Plant. The Company began to use its EC production line to carry out the pilot plant test since 2003. In September 2004, the Company established the Luzhou North Dadong Company to specialize in the production of the HEC. By applying the 500t/a HEC pilot line production technology of LNCC, the Company completed a	Independent development

Product name	Development time	Relationship between the development background motivation and the leading products	Development approach
		3000t/a HEC production line with the largest production capacity and most advanced technological level in China by December 2006. This is achieved through independent R&D and innovation as well as introduction of foreign advanced key equipment.	

5.2.2.1.Analysis of technical capacity of EC Products

EC Products are mainly used as additives for resin synthetic plastics, coating, rubber substitutes, printing ink and insulation materials, and as adhesives as well as textile finishing agent. As this product is difficult to produce, there is no domestic enterprise who invested on and produced this product in the past for a long period.

EC Product, produced by LNCC for a relatively long period, is military and civil product. Though LNCC adopts solvent slurry process which is a mature and leading technology in China, there is certain gas between product quality of LNCC and that of foreign countries. In the world, US Dow Chemical is the manufacturer of the best EC technical level and quality and the next is US Hercules. The company's EC Production technology is similar to that of Dow. Though, through sample comparison for many times, product performance of some products of LNCC can reach the level of Hercules's products and are close to the high-end market with absolute competitive advantage in China, scale economy is difficult to be realized and profitability is relatively weak due to obsolete equipment and other reasons. Therefore, EC Products of LNCC are considered to be of relatively high technical capacity and denoted as T^H Products.

5.2.2.2. Analysis of technical capacity of CMC Products

CMC is the one that has the largest output and is the most widely used and the most convenient for use among all cellulose ether products, also known as "industrial monosodium". CMC can form high-viscosity colloid and solution is characterized by adhesion, thickening, fluidity, emulsion dispersion, shaping, water conservation, colloid protection, film molding, acid resistance, salt tolerance, suspension and other features, without any physiological hazards, therefore it is widely used in such fields as food, medicine, consumer goods, petroleum, thesismaking, textiles, and buildings and so forth.

Involved in CMC industry for a relatively long period, LNCC has mature technology and a group of technicians having rich experience in scientific research and production, laying a favorable technical foundation. However, existing technical level of equipment of LNCC is relatively low, which make material consumption, energy consumption and labor cost of product high, and product mix gives priority to food, lack of product development in high-end application sector. From the perspective of the whole market, this product is of small investment and high technology availability, so many private enterprises developed quickly and surpass the former. Compared with these private enterprises developed later, many state-owned enterprises develop relatively slowly due to reasons in respect of equipment and market response and so forth. Therefore, CMC Products of LNCC are considered to be of relatively low technical capacity and denoted as T^{L-} Products.

5.2.2.3. Analysis of technical capacity of MC Products

MC is mainly used as additives in such fields as water conservancy mortar, building materials, environmental protection, medicine, PVC, food and cosmetics.

LNCC has been involved in production of MC Products for a relatively long period and its technology is mature. Level of production technology of MC Products of LNCC is relatively high. It is mainly reflected in the following aspects: first, LNCC has a complete range of products required by various industries; second, LNCC's products are divided into modified products and non-modified products and modified products meet the requirement of users for product functions, for example, the Company's products solve such problems in the course of cement mortar application as sliding down of ceramic tile, plaster mortar sagging, cavity generated after floor tile fixing and strength of cement mortar; third, the Company has advanced application labs and a group of application research engineers and is capable of providing technical solutions in accordance with different demands of users, improving product non-substitutability. However, in recent years, the core technology of MC is gradually mastered by most domestic MC producers and technical advantages of LNCC are not outstanding. Currently, production technology levels of domestic MC producers are basically at the same level, therefore MC Products of LNCC are considered to be of relatively low technical capacity and denoted as T^{L-} Products.

5.2.2.4. Analysis of technical capacity of HEC Products

HEC is mainly used as addictives for emulsion paint (environment-friendly water-based paint), cosmetics, consumer goods, oil drilling (though widely used in foreign countries, it is still not widely applied domestically to save costs and is only for special oil fields) and medicine (difficult to enter due to high entrance barriers).

Technical difficulty of HEC technology is relatively large, technology of most domestic enterprises is not mature enough and there is a big gap of product quality between domestic enterprises and oversea enterprises, making them less competitive. US Hercules has the best production technology among oversea enterprises. Though LNCC has just been involved in production and development of HEC Products for a short period, currently, it is more competitive all over the nation because of its advanced technology. However, as HEC Products of LNCC are still in the course of market expansion and the technology is still not stable at present, production and marketing capacity of 3000t/a hasn't been realized. To sum up, HEC Products of LNCC are considered to be of relatively high technical capacity and denoted as T^H Products.

5.2.3 Analysis of market potential of key products in cellulose ether industrial chain

Market potential refers to the optimistic estimate of a certain market for purchasing volume of a kind of product under specific circumstance and during a specific period. Market potential often depends on market demand potential and market share. That is, market potential is generally expressed as: market potential= market demand× market share. Therefore, analysis of market potential of key products in cellulose ether industrial chain of LNCC will be carried out based on these two factors.

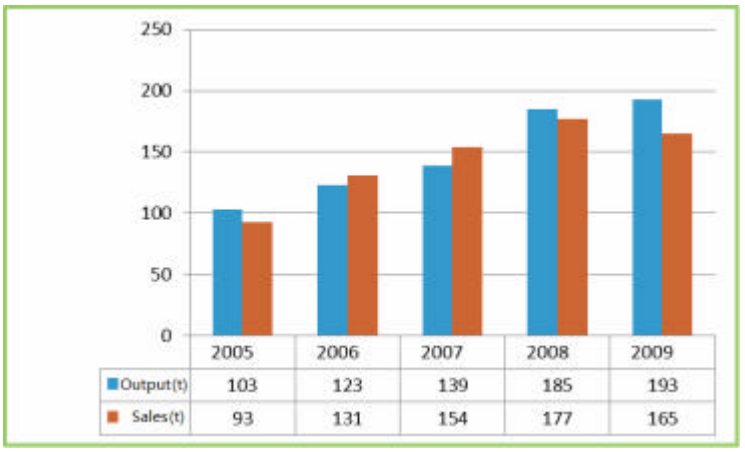
5.2.3.1. Analysis of market potential of EC Products

As EC is less used as addictives in application area, its total demand is weak and the global annual demand is around 8000-1000t/a, mainly monopolized by such foreign enterprises as DOW Chemical, Aqualon and Japan ASHA who account for about 90% of market share and the rest 10% taken by all domestic producers. Domestic output capacity is 500t/a (approx.), but practical operating rate is far less than 500t/a due to great technical difficulty and most products

are low-end. Currently, domestic demand is around 800t/a, most of which have to be imported. Major domestic producers are Shandong Tairui, Shandong A Hua Pharmaceutical and Shandong Heda which have small output. Annual output of LNCC is 200 tons (approx.), accounting for more than 40% of market share. Though products are mainly applied in mid-end and low-end sectors and high-end sector is still under the control of imported products, some products of LNCC also enter into foreign market.

EC Product of LNCC has maintained a certain growth during five years from 2005 to 2009, but due to financial crisis, the year of 2009 only saw a slight growth. As for production and sales ratio, only the years of 2006 and 2007 experienced the situation of supply falling short of demand, i.e. sales volume exceeding production volume and there were surplus products in all the rest years especially the year of 2009 when almost 20% of the products remained unsalable. See Figure 5-7 below.

Figure 5-7 Production and sales volume of EC Product from 2005 to 2009



Data source: Internal data of LNCC

It can be found from the data above that the overall market demand for EC Products is weak and it won't present an obvious increase trend in a short time despite EC Products of LNCC take a large market share. Taking market demand and market share together, we find that market potential of EC Products of LNCC is relatively low. Therefore, EC Products are considered to be of low market potential and denoted as P^L Products.

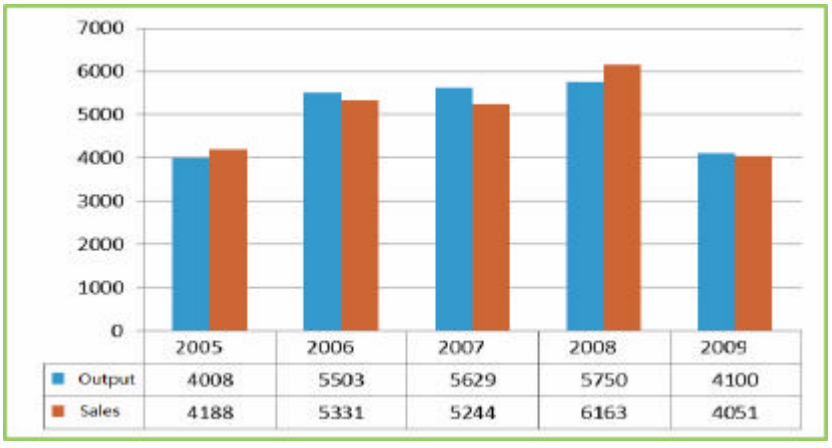
5.2.3.2. Analysis of market potential of CMC Products

Existing domestic capacity is 230000t/a and the demand is around 140000t/a. Currently, demand of projects planned and in progress is about 100000t/a, representing that over capacity

is quite serious. CMC Products, used as water-soluble anion cellulose ether, are widely used in such industries as food, cleaning, petroleum and building because of their low price and favorable dissolubility and undergo a relatively rapid demand growth. It is forecasted that the demand is expected to exceed 400000t/a and capacity will reach 600000t/a in 2015. From the perspectives of demand structure, as demand for high-grade CMC Products which are applied in such sectors as food, medicine, cosmetics, toothpaste and thesismaking and PAC Products of high purity is increasing, the consumption will account for 75% of total CMC output and crude CMC consumption only takes the rest 25% which tends to decline gradually.

Currently, LNCC produces 4600 tons CMC Products every year, accounting for around 4% of market share. The products are mainly applied in such sectors as food, petroleum, ceramic, toothpaste, and welding electrode and so forth. As for production and sales volume, CMC Product has maintained a balacned development trend in recent five years. Except for the year of 2009 when the production and sales volume declined largely, all the rest years have remained the capacity of 5500 tons per year as well as the balance between production and sales volume. Despite the financial crisis in 2008, CMC product still reached a high sales volume in that year. See Figure 5-8 below.

Figure 5-8 Statistics of CMC's production and sales volume from 2005 to 2009



Data source: Internal data of LNCC

Based on the data above, it can be found that over capacity of CMC Products is serious, corresponding market demand is weak and market share of CMC Products of LNCC is quite small. Taking market demand and market share together, we find that market potential of CMC Products of LNCC is relatively low. Therefore, CMC Products are considered to be of low

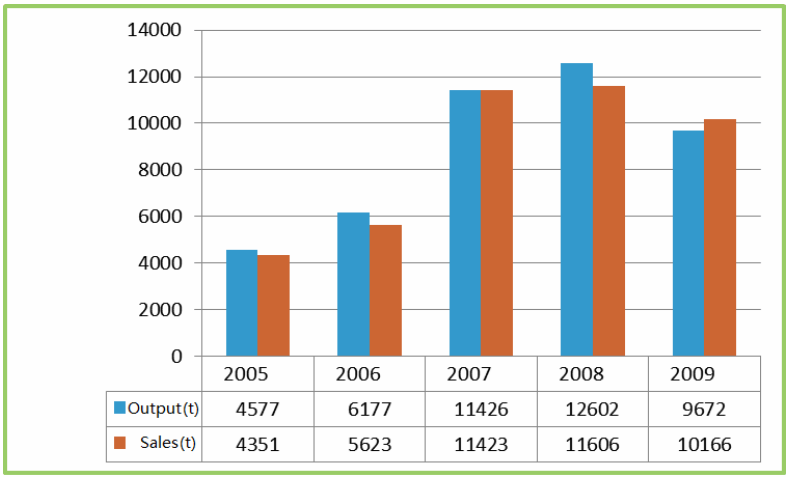
market potential and denoted as P^L Products.

5.2.3.3. Analysis of market potential of MC Products

Currently, the global total MC capacity is 327000t/a, China accounting for 121000t/a and oversea countries taking 206000t/a, and global market demand is around 200000t/a, China accounting for 30000t/a. It is forecasted that the global demand will exceed 280000t/a in 2015, China accounting for 65000t/a. MC consumption of building industry accounts for over 83.6% of total MC consumption, pharmaceutical industry for 9.8% and other industries for 6.6%. It can be seen from details above that the whole MC market is in over-supply status, especially China who in a terribly over-supply status. However, MC Product is a kind of developmental product which is mainly used in building energy conservation field. As China makes more efforts to energy saving and emission reduction and building energy saving has been enforced by the government on prefecture-level cities, resulting in increase of MC penetration rate in building industry, this product has a promising market outlook.

Sales of LNCC’s MC Product have always maintained a high level. Although overall sales volume was low, it has risen since the year of 2006 due to expansion of production capacity. On the whole, the production and sales volume of MC Product has maintained a stable upward trend, making it one of LNCC's products with sound sales performance.

Figure 5-9 Statistics of MC's production and sales volume from 2005 to 2009



	2005	2006	2007	2008	2009
Output(t)	4577	6177	11426	12602	9672
Sales(t)	4351	5623	11423	11606	10166

Data source: Internal data of LNCC

MC Product of LNCC has a strong competitive power. Currently, MC capacity of LNCC reaches 10000t/a and the domestic market share basically stabilizes around 25%. Meanwhile, the company actively expands Latin American market and Asian market depending on advantages of technology and quality of MC Product. Currently, MC Product for exportation accounts for 80% of the Company's total MC output.

It can be seen from the data above that MC Product of LNCC is more competitive and has a relatively large market share despite the domestic market of MC Product is in an over-supply status. Meanwhile, 80% of MC Product of LNCC enters into international market, therefore the total demand of the market can be considered as that of the world. Taking market demand and market share together, we can find that MC Product of LNCC has a relatively high market potential. Therefore MC Product is considered to be of relatively high market potential and denoted as P^H product.

5.2.3.4. Analysis of market potential of HEC Product

Currently, the overall domestic capacity is around 9500 tons generated by more than 20 small-scale producers whose capacity is below 1000 tons. 3000t/a product line of LNCC is the largest and capacity of other manufacturers is below 1000t/a. actually, the practical output is far less than capacity of the equipment due to low operating rate resulting from technology and other reasons. Domestic output in 2008 was around 2615 tons and demand was 7200 tons, which means that a large amount of HEC Products were required to be imported. However, a

10000t/a product line invested and established by Hercules in Nanjing was completed and put into operation in December 2010, which will make the domestic capacity close to 20000t/a. If it mainly focuses on domestic market, establishment and operation of the product line will greatly exert impact on the domestic market. However, domestic market demand, which is forecasted to reach 22000t/a, is undergoing a rapid growth, there is still a large market demand.

Currently, annual output of LNCC is 660 tons with a small market share. Coating industry is the primary market.

It can be found from the data above that overall market demand for HEC is relatively large as market demand for HEC Product is but with inadequate capacity. Although current market share of LNCC is relatively small, market share in the future will present a growth trend as advanced production technology allows production of HEC Product of high quality. Taking market demand and market share together, we can find that MC Product of LNCC has a relatively high market potential. Therefore HEC Product is considered to be of relatively high market potential and denoted as P^H Product.

5.2.4 Summary of analysis of key products in cellulose ether industrial chain

Based on the three key factors, gained from weighted precedence chart, which affects development of cellulose ether industrial chain of LNCC, in combination with the enterprise's own capacity and external environment, through analysis of value growth, technical competence and market potential of key products in cellulose ether industrial chain, we can us three variables as value growth (V), technical competency (T) and market potential (P) to describe key products in cellulose ether industrial chain of LNCC. According to the above analysis we will describe the key products in cellulose ether industrial chain of LNCC as follows: EC is $V^HT^HP^L$ Product; CMC is $V^LT^LP^L$ Product; MC is product of $V^HT^LP^H$ Product; HEC is $V^LT^HP^H$ Product.

To be specific, EC is one of LNCC's competitive products. The product maintains a high share in the industry and plays a leading role in the market. Moreover, LNCC's production technology of EC is in a domestic leading position. However, EC's sale growth rate has declined year by year with small market potential and the development of this product is

therefore faced with certain restrictions.

Affected by both market factors and internal factors of the enterprise, CMC is the least competitive one among LNCC's four major products. CMC has small market share and low technical level and the product is operated at a loss as the sales growth rate fluctuates largely and the profit rate has always been negative.

HEC is one of the major products of LNCC. The product has high value content and is difficult to produce. LNCC is in a leading position and is very competitive in terms of HEC's production technology. Nonetheless, the product has limited contribution to LNCC as the market demand is low and no trend of obvious growth will be showed in a short time.

MC is the most competitive product of LNCC. Net profit of the product has remained at a high level for a long time and the product occupies majority of market share. The sales have gone up rapidly especially in recent three years, and LNCC is in a leading position and is very competitive in terms of MC's production technology.. Thus, it will be easy for LNCC to maintain the competitive advantage of MC product.

5.3 Strategic choice of key products in the cellulose ether industrial chain of the case company

Many scholars have studied strategic choice of key links in the value chain based on value creation. They hold that the more special, more irreplaceable and more inimitable of value creation method (higher technology level), the higher of its value (Morrow et,al.2007). Therefore, features of any link in the value chain are determined by two variables, namely, value (V) and technology (T). In the actual value chain, if one link features in high value, many manufactures or their opponents will be attracted. However, the high knowledge and technology requirements will keep off many manufactures or their opponents who want to enter this link. Therefore, value and technology is a pair of two opposite factors in the value chain. And a further analysis shows that the link features in high value but low knowledge and technology requirements will attract a lot of participants in a short time, leading to a decrease of the value in this link; at the same time, the link features in high value and high knowledge and

technology requirements will bring about certain profits due to the high entering barrier. The high entering barrier will keep many new enterprises off from an industry and thus increase profits of the existing participants in the industry, or may lead to a control over the whole industry by a few enterprises (Mainkar, et.al.,2006). In most cases, we assume that high knowledge and technology level (or eventually) lead to a high value, and vice versa. See Table 5-7 for the value creation-based evolution rule of key links in the industrial value chain.

According to the above evolution rule of key links in the industrial value chain, we can classify products of key links in the industrial chain into four categories for the value creation-based strategic choice of products, namely, V^LT^L Product, V^LT^H Product, V^HT^L Product and V^HT^H Product. In accordance with features of each category of products, we propose recommendations on strategies should be taken and industrial chain-based strategic choice. (see Table 5-8).

Table 5-7 Value creation-based evolution rule of key links in the industrial value chain

		Value (V)	
		Low (L)	High (H)
Technology (T)	Low (L)	Low attraction and small resistance, a stable status (low value end)	Big attraction, small resistance and increased competition, an unstable status
	High (H)	Small attraction, big resistance and increase of monopoly, an unstable status	Big attraction and big resistance, a stable status (high value end)

Table 5-8 Value creation-based strategic positioning of products in the key links of the industrial chain

Name of product	Features	Recommended strategy	Industrial chain-based strategic choice
V^LT^L (CMC)	A low value increment and low technology level means excessive production capacity and low technological barrier, which is less attractive to manufacturers.	Products of this type are of no strategic investment value. A large scale economic advantage can be obtained through control of the cost. If there is no economic profit for a long time, products of this type should be abandoned.	For industry with high exiting barrier, large enterprises can integrate the industrial chain by reducing the cost or realize industrial transformation by integration of irrelevant businesses.
V^LT^H (HEC)	A low value increment but high production technology level means a high technology barrier but low market recognition.	Investment in products of this type are very risky. When selecting development strategy for products of this type, whether the market capacity is growing rapidly should be considered. If the market capacity	If the rapid market development can make up risks of products of this type, these products may be selected as a prioritized strategy. Enterprises may expand market share of these products in the industrial chain and increase their

Name of product	Features	Recommended strategy	Industrial chain-based strategic choice
		is growing, market share should be expanded, and meanwhile technology research and development should be sped up.	competitiveness by increasing investment.
V^HT^L	A high value increment but low production technology level means great attraction to manufacturers because of low technology barrier, leading to excessive production capacity.	This type of products is very attractive. Enterprises should reduce the cost of products of this type and improve their competitiveness by developing good brand and sales channel.	Defense type strategy, such as lowering the trading cost to reduce the dependence on other enterprises in the industrial chain in steps and seeking industrial transformation opportunities should be adopted for products of this type for their poor development prospect.
V^HT^H (MC, EC)	A good value increment and high technology level means good profitability and high technology barrier. Products of this type should be selected as a prioritized strategy.	Products of this type should be selected a prioritized strategy. Enterprises should increase investment in products of this type, increase market share, occupy competitive position in the industry and improve technology barrier as well.	Industrial chain-based strategy for products of this type should be: increasing investment and strengthening the leading position in the industrial chain; and meanwhile, seeking integration opportunities upstream and downstream industrial chain in order to become an industrial chain integrator.

In order to make a value creation based strategic choice of key products in the cellulose ether industrial chain of LNCC, we could classify the four key products in the industrial chain with the abovementioned product classification method by referring to the previous analysis of LNCC's key products in the cellulose ether industrial chain, that is, EC is V^HT^H Product; CMC is V^LT^L Product; MC is V^HT^HProduct; and HEC is V^LT^H Product. In accordance with the value creation-based strategic positioning of products in the key links of industrial chain (Table 5-8), development strategy for LNCC's key products in the cellulose ether industrial chain could be concluded as follows: focusing on EC, MC products, prudently investing in HEC products , and gradually eliminating CMC products.

However, in accordance with our previous study, factors that affect LNCC's strategic choice of key products in the cellulose ether industrial chain include value (V), technology (T) and market potential (P). Therefore, strategy selection based on value creation only will lead to a mismatch with the market. For this reason, in addition to the value-creation-based strategic positioning model of products in the key links of industrial chain, we will analyze strategic choice of LNCC's key products in the cellulose ether industrial chain by introducing the factor – market potential (p).

After introducing market potential (P), strategic positioning model of products in the key links of industrial chain is as shown in Table 5-8.

We have studied and classified LNCC's key products in the cellulose ether industrial chain based on value increment, technology and market potential as follows: EC is $\mathbf{V^HT^HP^L}$ Product; CMC is $\mathbf{V^LT^LP^L}$ Product; MC is $\mathbf{V^HT^HP^H}$ Product; and HEC is $\mathbf{V^LT^HP^H}$ Product. In accordance with strategic positioning model of products in the key links of industrial chain (Table 5-9), development strategy of LNCC's key products in the cellulose ether industrial chain should be: focusing on MC products, moderately developing HEC products, stably developing EC products, and gradually eliminating CMC products.

Table 5-9 Strategy positioning of products in the key links of the industrial chain

Value creation factor	Market potential (P)	Name of product	Features	Recommended strategy	Industrial chain-based strategic choice
V^LT^L	P^L	$V^LT^L P^L$ (CMC)	Low value increment and technology level, and small market potential.	Products of this type are of no strategic investment value. Products of this type should be abandoned if they have no scale advantage in the current stage.	For industries with high exiting barrier, enterprises may achieve industrial transformation by integration of irrelevant businesses.
	P^H	$V^LT^L P^H$	Low value increment and production technology level but great market potential.	Products of this type have no strategic investment value. But enterprises can still gain economic profits by expanding production scale due to their market potential.	Enterprises may integrate industrial chain by reducing costs, or integrate irrelevant businesses to achieve industrial transformation.
	P^L	$V^LT^H P^L$	Low value increment, small market potential but high production technology level.	Products of this type are of certain strategic investment value. But they are also very risky. So investment in products of this type shall be carried out prudently, like investing in a small amount firstly to check reaction of the market.	Enterprises may integrate the industrial chain by taking advantage of technology strength in the industrial chain or develop the related multiple businesses by taking advantage of technology strength to achieve industrial transformation.
			Low value increment, but great market	Products of this type are of great strategic investment value. In the short term,	Enterprises should focus on this key link of the industrial chain and obtain control over

Value creation factor	Market potential (P)	Name of product	Features	Recommended strategy	Industrial chain-based strategic choice
V^LT^H	P^H	$V^LT^H P^H$ (HEC)	potential and high production technology level.	enterprises should focus on development of products of this type by utilizing favorable resources in order to get ready for competition in the future market.	the whole industrial chain through control over this key link.
V^HT^L	P^L	$V^HT^L P^L$	Low technology level, small market potential but high value increment	Products of this type have no strategic investment value. With regard to products of this type, enterprises should maintain the current market share by establishing good company reputation and providing good products and services.	Defense type strategy, such as reducing the trading costs to reduce dependence on other enterprises in the industrial chain by steps and seeking industrial transformation opportunities, should be adopted for products of this type.
	P^H	$V^HT^L P^H$	Low technology level, but high value increment and great market potential.	Products of this type are of certain strategic investment value. For products of this type, enterprises should reduce the production costs, develop good brand and company reputation and provide good products and services in order to increase market share of the products.	Enterprises may integrate the industrial chain vertically to reduce dependence on other enterprises in the industrial chain. For enterprises of strong competitiveness, they may carry out super-large scale merger and acquisition in order to control the whole industrial chain.

Value creation factor	Market potential (P)	Name of product	Features	Recommended strategy	Industrial chain-based strategic choice
V^HT^H	P^L	$V^HT^H P^L$ (EC)	Small market potential, but high value increment and technology level.	Products of this type are of certain strategic investment value. But instead of expanding excessively, the investment scale should be controlled within the market range.	Enterprises should invest in small scale in order to stabilize its position in the industrial chain or seek opportunities to integrate industrial chain in order to expand the upstream and downstream industrial chain.
	P^H	$V^HT^H P^H$ (MC)	High value increment, technology requirements and great market potential.	Products of this type should be selected as a prioritized strategy. But many other enterprises are attracted to invest in products of this type as well. Therefore, enterprises should focus on development of products of this type by utilizing a majority of favorable resources in order to obtain a competitive position in the competition.	Industrial chain-based strategy for products of this type should be: increasing investment and strengthening the leading position in the industrial chain; and meanwhile, seeking opportunities to integrate the industrial chain by integrating enterprises in the upstream and downstream in order to obtain the position of industrial chain integrator.

Comparison of these two strategic positioning models shows that there is an obvious difference on LNCC's strategic choice of cellulose ether industrial chain after introducing market potential. Since profit is the ultimate goal of an enterprise, and value of operation and production of an enterprise are realized through trading in the market eventually, market with

small potential is less attractive to enterprises. When making the strategic choice, enterprises will avoid fields with small market potential. Instead, they will seek for fields which can support the sustainable future development of enterprises.

5.4 Cellulose ether industrial chain and product positioning of LNCC

Cellulose ether products were newly developed by LNCC in recent years. After nitrocotton products were listed, LNCC started to focus on nitrocotton-related cellulose ether products in order to find a new profit growth point. LNCC has rapidly developed a new business in a diversified way and increased the production of cellulose ether products such as methyl cellulose and hydroxyethyl cellulose, thus forming a new industrial pillar. As for technology, among the four major cellulose ether products of LNCC, three of them except for carboxyethyl cellulose have reached internationally-advanced technical level. In terms of production, all products except for carboxyethyl cellulose have some common features and are only different from each other in specific production processes.

Industrial chain of LNCC's cellulose ether products is mainly composed of four kinds of products that have already been mentioned above. Based on the aforesaid analysis of the products on cellulose ether industrial chain (See Table 5-10), strategic positioning of these products is as follows.

Table 5-10 Comparison of value growth, technical content and market potential of MC, HEC, EC and CMC

	Value Growth	**Technical Content**	**Market Potential**
MC	+	+	+
HEC	-	+	+
EC	+	+	-
CMC	-	-	-

Table 5-11 Development positioning of LNCC's fiber derivatives

Product name	Development strategy
Ethyl cellulose	Investment in ethyl cellulose products should be within a limited amount and attention needs to be paid to return on investment. It is necessary for LNCC to utilize as many existing facilities as possible to maximize production and implement flexible control on ethyl cellulose products to allow more free development and improve management efficiency.
Methyl cellulose	LNCC needs to increase the input in methyl cellulose products and reasonably allocate resources. It can provide certain preferential policy supports to increase market share of methyl cellulose products and develop this kind of products as LNCC's second nitrocotton business that leads the market.
Carboxymethyl cellulose	LNCC needs to decrease the input in this product, cut expenses, gradually eliminate backward production capacity, strip the business unit off and transfer resources in this product unit to other more promising product units.
Hydroxy ethyl cellulose	It is necessary for LNCC to invest appropriately, develop with a steady pace, improve technology, occupy the market and provide more capital in overall development of the enterprise.

Chapter 6: Conclusions and Outlook

6.1 Main purpose of this Thesis

1. This Thesis has reviewed the enterprise development theory, theory of enterprise development strategy, industry value chain theory and diversification strategy choice theory.

By reviewing the enterprise development theory, we have reached a conclusion that the enterprise development is not only about the enterprise scale and profit growth. The enterprise development quality is also an important factor in regard to this. By reviewing the theory of enterprise development strategy, we believe that the enterprise's choice of development strategy needs to take into account not only the external environment but also the enterprise's resources and capabilities. This has provided a theoretical principle for the case study in this Thesis. The review of the industry value chain theory has provided a theoretical guidance for identifying and selecting the industrial chain and for analyzing the industrial chain in this Thesis. The review of the diversification theory has provided a reliable guarantee for determining the industrial chain-based strategic choice direction in this Thesis.

2. This Thesis has selected and ranked the factors that may affect the strategic choice on the cellulose ether industry chain in northern China. Besides, it has conducted a detailed analysis of value creation, market potential and technical level of SBU on the cellulose ether industry chain.

Through document and enterprise research and interviews, the main factors that may affect the strategic choice of Luzhou have been identified. By organizing LNCC senior leaders to evaluate and rate the influencing factors, the three most critical factors that will affect the strategic choice of LNCC have been extracted. By collecting relevant data of the enterprises and industry and collating the interview data, this Thesis has conducted a detailed analysis on SBU on the cellulose ether industry chain from the perspectives of value creation, market potential and technical level.

3. This Thesis has carried out the strategic positioning of SBU on the LNCC cellulose ether industry chain and proposed the Company's future business unit of strategic development.

As the enterprise strategic choice criterion is based on the value creation and technical level, this Thesis has carried out the strategic positioning of main products on the LNCC cellulose ether industry chain. On this basis this Thesis has introduced market potential factors and put forward a strategic positioning model for the SBU on the LNCC cellulose ether industry chain by taking into account the three factors of value creation, technical level and market potential. This Thesis has carried out the strategic positioning of main products of LNCC on the basis of the above-mentioned model and compared this strategic positioning with that derived under the conditions of value creation and technical level. Thus, it has determined the strategic development direction for the main SBUs on the LNCC cellulose ether industry chain.

6.2 Major conclusions of this Thesis

Once an enterprise selects diversification as its development strategy, an assessment of the value creation potential of its new businesses becomes a key factor determining the success of diversification. The majority of the failures in diversification are caused by mistakes in assessing the diversified businesses (Zhu, 1999). A state-owned military chemical enterprise like LNCC is a military industrial controlled by the state and possesses obvious advantages on the chemical industrial chain with financial and technical support from the state. Though these enterprises are constrained by some state policies on its way of diversification (Yan, 2012), their prime concern in implementing diversification strategy is still the new businesses' value creation potential (Yin, 1998).

The conventional view of value creation (Morrow,et.al., 2007) measures the value creation potential of a business with two indicators, i.e., its value content (V) and technical content (T). But there is an implicit and fundamental assumption behind this view—the value of a business can be recognized by the market naturally. However, in fact, though some business does have strong potential in value creation, the market demand for this business is severely inadequate, which renders it unable to prove its value in the market. The thesis,

through studying the cellulose ether industry chain of LNCC, concludes that though EC business has high value and technical content, its market demand has been small, so its value contribution to LNCC is very limited. Also, seen from the scoring of decision-making factors of major businesses on the cellulose ether industry chain by managers of LNCC, value growth, technical content and market potential are the major factors affecting strategic decision-making in the eyes of managers. Therefore, this thesis, based on the value creation theory of Morrow,et.al. (2007), adds in another decision-making factor—market potential (P). These three factors form the positioning model for diversification strategy.

With the help of the positioning model for strategic choice of diversification, by exploring the value growth (V), technical content (T) and market potential (P), we derive 8 types of business: VLTLPL, VLTLPH, VHTLPL, VHTLPH, VLTHPL, VLTHPL, VHTHPL and VHTHPH , and proposes specific diversification suggestions for each type of business (see Table 5-10, 5-11).

This thesis take LNCC as the case company, nevertheless, its conclusions derived are universally applicable, and can serve as guidance and inspiration methodologically and strategically for diversification based on industry value chain of chemical enterprises similar to LNCC in nature.

6.3 Limitations of the study and avenues for future research

1. There has been little research on the effect weights of value creation, technical level and market potential. The method used is to build a strategic positioning model based on value creation and technical level before introducing the market potential. The results of the strategic positioning may be different since the sort order of these three factors is not the same. This depends on the effect weights of said three factors. Therefore, it is necessary to conduct a detailed study on the effect weights of said three factors.

2. The Thesis has worked out the strategic positioning of key products on LNCC's industrial chain through analysis of value creation, technical level and market potential of such key products. In the course of analysis, the focus was put on the operation state of

LNCC's competitors without considering the measures to be taken by the competitors to respond to LNCC's strategic actions. Response of the competitors can directly affect the implementation results of the enterprise's strategies. However, since the response which has not been made is hard to be measured directly, the next step needs to consider how to analyze the impact of the competitors' response on LNCC's strategic positioning.

3. As LNCC is a typical state-owned military chemical enterprise of China, taking it as a case company for analysis can reflect characteristics of China's state-owned military chemical enterprises in an effective way. Since the attention was paid to the analysis of key products on LNCC's industrial chain and the analysis was carried out on the basis that the country has gradually decreased the restrictions on the state-owned military chemical enterprises, relevant restrictions on the state-owned military chemical enterprises from the country's policies were ignored in the Thesis. Actually, in Chapter IV relevant interviewees from LNCC have talked about the impact of national policies on the enterprise's strategies. Therefore, the impact of national policies can be appropriately included in the next analysis period.

4. Although it has put forward the strategic positioning and strategic development proposals for the main products on the LNCC cellulose ether industry chain, it lacks the discussion on the implementation strategies and steps. Anyway it is necessary to develop specific tactics and strategies for the implementation process of the enterprise strategy. Since the main research focus of this thesis is on the strategic positioning of main products on the LNCC cellulose ether industry chain, it has conducted no in-depth discussions on specific tactics and strategies for the implementation process of development strategy.

5. This thesis has mainly conducted a longitudinal single case study on LNCC. The conclusions reached are in line with the reality of LNCC and can provide certain guidance and reference to the formulation of development strategies for LNCC. However, certain deviations may arise when generalizing the research conclusions to other enterprises in the specialty chemical industry. Therefore, attention should be paid to the actual situation of the enterprise when making any appropriate adjustments and changes during the process of promoting the research conclusions reached in this thesis.

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Appendix 1: Interview Outline

1. Please tell us about your company's current operating status, including operation conditions of your company's main products (MC, CMC, EC and HEC) on the cellulose ether industry chain in recent years.

2. How do you describe the entire industry and market environment of your company? What competitions does your company have to face?

3. What are the major links do you think on the cellulose ether industry chain? How will the values of various links be distributed?

4. What are the key links do you think on the cellulose ether industry chain? Why do you think they are key links? What are the factors you have used for judgment?

5. In what position do you think your company's main products on the cellulose ether industry chain? What are the advantages and disadvantages respectively in your company's products?

6. What are the key stages your company has gone through during the development process of the main products? What are the main problems encountered in the development process? By what way has your company dealt with these problems?

7. What are the key factors do you think that may affect the survival and development of the main products? Why?

8. What products do you think your company should focus on developing in the next few years? Why?

9. What are your plans and ideas on the future development of your company's major cellulose ether products?

Appendix 2: List of Factor Raters

1. Jiao Jinsong, Deputy CPC Party Secretary of LNCC, engaged in management of LNCC for 25 years.

2. Yang Hecheng, Director of Strategic Planning Committee of LNCC, engaged in management of LNCC for 12 years.

3. Liu Hongjie, Director of Technical Committee of LNCC, engaged in management of LNCC for 25 years.

4. Liang Honglang, Director of Informatization Committee of LNCC, engaged in management of LNCC for 17 years.

5. Pan Jian, Director of Human Resources Committee of LNCC, engaged in management of LNCC for 19 years.

6. Hao Jianhua, Sales Company Manager of LNCC, engaged in management of LNCC for 21 years.