

RESEARCH ON CHINA'S GIS INDUSTRY

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ABSTRACT:

As an important component part of the information industry, the pillar industry in 21st's century, GIS Industry greatly affects national comprehensive capability and defense safety. After the several decades' development, China's GIS Industry has already had a large scale from scratch and reached a high technological level. However, there are still many problems restricting the healthy, fast growth of China's GIS industry, such as short development history, industry's maturity and marketization at a low level, etc. In this paper, based on in-depth analysis of the status, characteristics and environment of China's GIS Industry, combining with the relative theories of strategy management and industrial economics, the competitive strategies and development suggestion for promoting the healthy and rapid development of China's GIS industry are put forward from the various angles: government, companies, customers etc.

1. INTRODUCTION

Geographic information system (GIS) is an interdisciplinary of Computer Science, Geography, Surveying and Mapping, Cartography etc. And the development and application of GIS technology is the most striking technology in the past few decades. After the introduction of GIS into China nearly 30 years ago, the GIS technology has reached a high level and GIS Industry clusters with Chinese style has come into being. In the national Eleventh Five-Year Plan, GIS technology has been ranked as one of the four important issues with remote sensing, navigation and spatial exploration technology in Earth Observation and Navigation area (According to the document of ZBF [2002] No.17).The future of GIS industry is very promising.

With the strong support of the government, China's GIS Industry is fast-growing in the scale of industry, technological level and rich in human resources. But compared with some developed countries, there are still some factors restricting the healthy growth of China's GIS industry. This paper is based on current status and features of China's GIS Industry environment, using the models and theories of strategy management and industrial economics to give some suggestions for the healthy rapid growth of China's GIS Industry.

2. STATUS OF CHINA'S GIS INDUSTRY

2.1 Objects of GIS Industry

According to the classification of an international authoritative information evaluation organization, the objects of GIS industry include hardware, software, data collecting and transformation, electronic data, remote sensing information acquisition and processing, system developing and integration, consulting and technology service. (Please see Figure 1)

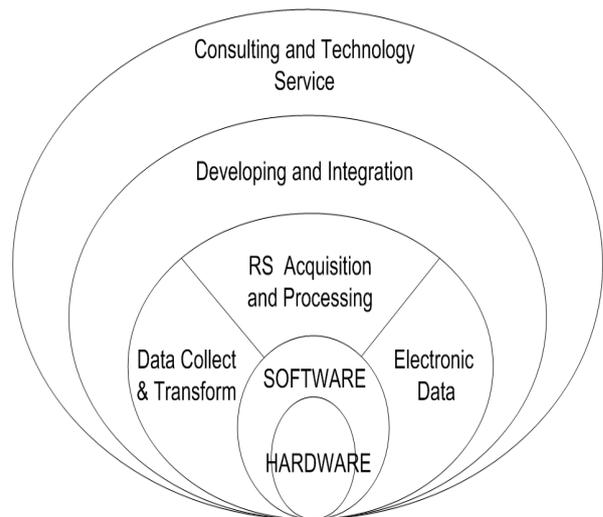


Figure 1. The Structure of GIS industry objects

Presently, objects of China's GIS Industry are mainly focusing on data production and supply, GIS software products and technology, GIS application and service, the end-market and end-user of GIS industry.

2.2 China's GIS Industry Chain

At present, GIS industry chain includes mainly 4 links: data companies (data production and supplier) and GIS software providers upriver, GIS application and service companies in the middle reaches, the customers downriver. Considering the demand for the consulting and technology service in the future, we can see the structure of the China's GIS industry chain as Figure 2. (See Figure 2)

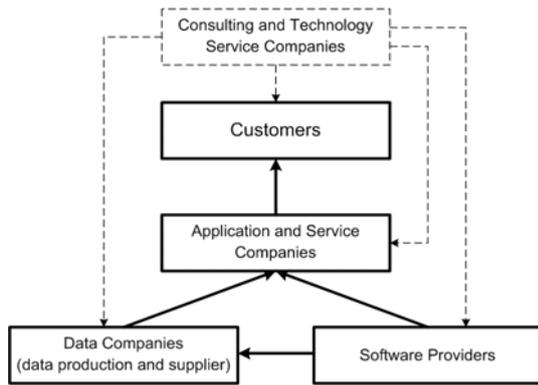


Figure 2. Structure of China's GIS Industry Chain

Note: Since the China's GIS industry has hard any GIS Consulting and Technology Service company until now, this link is drawn with the dotted line in the above figure.

2.3 Fast-growth of GIS companies

In 1990's, there were only 20 GIS companies (include joint ventures) at most in China, all of them were small in scale and most survived with support of the government. Today, there are more than 400 specialized GIS companies. Though small and medium-sized companies still take the mainstream, 80% companies' registered capital is between 500 thousand and 2 million RMB Yuan, and the other 20% is about 10 million RMB Yuan. The biggest GIS Company has about 200 staffs, and 25% companies have staffs between 100 -200. According to a recent research, Beijing, Shanghai and Guangdong have become the three GIS spatial centers in China.

With the expanding of GIS application areas, some traditional IT companies has entered into the GIS industry, such as Nuesoft, POTEVIO, Digital China, ZTE, Datang Telecom etc. It can be predicted that the joining of the traditional IT companies will accelerate the integration of GIS and traditional IT technology, and also promote the optimization of GIS companies in the industry.

2.4 Continuous Expansion of market scale

At present the global GIS product market scale amounts to \$1 billion dollars, and the revenue of GIS-related software, hardware and service reaches nearly \$10 billion dollars every year. China's GIS market is growing rapidly and the market capacity is big. According to the data from China's software industry, the output value of GIS software sales and technology service in 2000 was 1.5 billion RMB Yuan and by the end of 2005 the number was exceed 3 billion RMB Yuan, which is equivalent to more that 50 times in ten years ago.

Main Objects of the China's GIS Industry are data, software and application integration, since the technical consulting service has not shaped, which is based on a mature industry chain. The users of GIS application system are mainly from government departments, enterprise and public service. Among them, the government is the most important customer of GIS, but recently non-traditional GIS application fields and enterprises also bring forward a large demand to GIS, and those enterprises are becoming into the important customer of GIS. As for the public service, the business model is not very clear and the market is still in the start-up phase, however, the giant market prospect shouldn't be ignored.

3. CHARACTERISTICS OF CHINA'S GIS INDUSTRY

Along with the fast developing of China's GIS Industry, GIS technology has been used in more and more fields. Through the analysis of current status and the development of China's GIS Industry, we can conclude:

3.1 Favourable Macroeconomic Environment supports fast-growth of GIS industry

Central Government and domestic governments have paid great attention on the development of GIS industry. From the ninth Five-Year plan, the Ministry of Science and Technology has financed the domestic GIS software with special funds, and has prior developed GIS industry in the high-tech fields. From policy, research to the technology orientation, the government's support plays a key role to the fast growth of the GIS industry.

3.2 Domestic GIS software is becoming the main force in the market

Under the guidance of state policy, domestic GIS software technology is maturing and becoming competitive, and market share of domestic GIS software is more than 30%, therefore domestic software has the technologic strength to compete with foreign software positively. Integrated with advantages in policy, price and service, domestic GIS software is becoming the mainstream of the market step by step.

3.3 Policy of the use of geographical spatial data restricts the development of the China's GIS industry

Compared with the developed countries, the policy limit to the use of geographical spatial data and the restriction of spatial data acquisition limits the development of GIS industry. Now the Government is solving this problem by promoting the construction of national geographical spatial infrastructure. (Kong Yunfeng's statistics, see also the reference)

3.4 The industry has more state-owned enterprises with research orientation and less large private-owned enterprises. Furthermore, the industry is short of comprehensive specialists of enterprises management and marketing.

An investigation made by major GIS companies in China shows that the number of GIS companies with annual turnover more than 50 million RMB Yuan is extremely small, in 2005 only two GIS software companies: Supermap and Zhongdy attained the target. Because GIS technology was introduced to China by the research institute, many GIS companies are scientific research-oriented: The scale of company is small, so is the number of large private GIS companies. Since many GIS companies are operated by the GIS scholars or specialists, the rapid growing GIS industry is short of the comprehensive talents of enterprises management and marketing.

3.5 The industry division is not clear and the industry chain is immature

Making a comprehensive survey to China's GIS industry, the major large strong GIS companies could provide data, software and GIS application and service, almost covering the entire industry chain, but the small companies could offer the GIS application integration service. This industry pattern indicates that the GIS industry division is not clear, and industry chain is still immature.

4 CHINA'S GIS INDUSTRY ENVIRONMENT

a) Discrete Industry Environment

Although a considerable quantity of medium-sized and small-sized companies exist in China's GIS industry, no one pillar firm can be found at all. China domestic GIS software companies have made a great achievement, and some of them grow into key companies, but none of them can dominate the industry: the multitudinous GIS companies are carrying on the competition based on the different GIS fundamental software platforms. Therefore, under such an Industry environment as typical discrete as China's GIS industry, the firm which can emerge as quickly as possible must become the leader of China's GIS industry in future.

b) Fast-Growing Industry Environment

Modern information technology, traditional geography, surveying, cartography have formed an interdisciplinary technology and subject: GIS. GIS technology promotes the rapid development of GIS industry with core products focusing on GIS technology and service. According to the Theory of Industry Life Circle, an industry goes through the following stages: introduction, growth, maturity and decline. China's GIS industry has passed the first stage and is stepping into the second stage. Meanwhile the industry chain is becoming gradually mature.

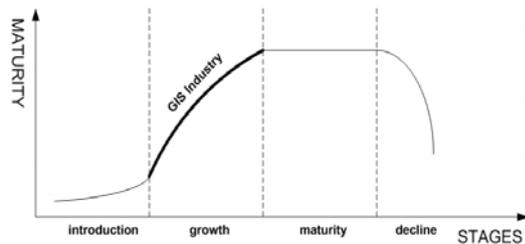


Figure3. GIS Industry Development Stages

The fast growth means China's GIS industry has no the best recognized product structure and the competition among products and companies is very fierce. How to promote the industry's fast-growth by market forces and how to prevent vicious competition and create a benign industry environment, are very important topics that should be concerned by the government.

5 COMPETITIVE STRATEGIES OF CHINA'S GIS INDUSTRY

5.1 Genetic Strategies of GIS Industry

According to Michael Porter, there are three types of generic strategies to bring the corporations successful opportunities: overall cost leadership strategies, differentiation strategies and focus strategies.

Through the above analysis to the China's GIS industry, it can be found that data suppliers companies are labor-intensive, software companies are technology-intensive and Application and service companies should find a balance between labor-intensive and technology-intensive according to their target customers. The products of Date companies and Software companies can be used in the aggregate market, and the

customers of application and service companies come from the special segmental markets.

Although, the GIS companies orientation is not as single as appeared in the GIS industrial chain, and their goals are not unique, so does the strategies they take, Under ideal conditions, overall cost leadership strategy is suitable for data companies, differentiation strategy is fit for software firm and focus strategy is more suitable for Application and service companies, since date companies are labor-intensive, software firm are technology-intensive and Application and service companies are knowledge-intensive.

The request for the technology, resource and organization which the related companies with different orientation, please see the following table:

Companies on industry chain	Genetic strategies	Technology and Resource	Requirement
Data companies	overall cost leadership strategy	<ul style="list-style-type: none"> ◆ processing technology ◆ Strict management to workers ◆ highly efficient production plan ◆ persistent ability of capital spending and funds accommodating 	<ul style="list-style-type: none"> ◆ well structural organization and clearly demarcated responsibility ◆ measurable goal based incentive ◆ strict cost control
Software companies	differentiation strategy	<ul style="list-style-type: none"> ◆ strong marketing ability ◆ strong innovation ability ◆ strong fundamental research ability ◆ technology-leading fame ◆ unique technology advantage 	<ul style="list-style-type: none"> ◆ the close cooperation between the departments of research, development and marketing ◆ an incentive mechanism with great attention to subjective evaluation ◆ pleasant atmosphere, attract competent people
Application and Service companies	focus strategy	<ul style="list-style-type: none"> ◆ To aim at the concrete application service targets, constituted by the combination of the above 	<ul style="list-style-type: none"> ◆ To aim at the concrete application service targets, constituted by the combination of the above

Table4. The genetic strategies of the different companies of the GIS industry

5.2 Competitive Strategies under the discrete industry environment

Under the discrete industry environment, there are some typical features such as: barriers to entry is low, the large-scale production is relatively weak, and the industry application demand is complicated, furthermore, existing companies have not grasped enough skills and ability to occupy the important market share, etc. Meanwhile, they also denote China's GIS industry and industry chain is immature.

Discrete GIS industry environment is only a transient phenomenon during the period when China's GIS industry is rising, GIS companies must gradually transform from regarding technology as the core to pay equal attention to both technology and market. As the GIS companies introduce more and more professional managerial talents and market talents, GIS industry chain is continually subdividing, and the new resource, technology, knowledge are poured in continually from outside the GIS industry, GIS industry will say good-bye to the discrete industry's shape and invigorated pillar companies will emerge finally!

5.3 Competitive Strategies under the developing industry environment

China's GIS application cluster is keeping fast growth and new GIS companies are keeping emerging fast. The aforesaid phenomena prove that China's GIS industry is still at new developing stage. In addition, the following factors also explain it, such as technology uncertainty, strategic uncertainty, and to obtain state load support, etc.

The most remarkable feature of a new industry is an absence of game rule. As to China's GIS industry, this is shown as follow: there is no unified standard of products and technology, the advanced and backward technology coexist, it is very difficult for customers to choose a suitable plan from multitudinous choices, project quality is unstable, the firm size is small and financing ability is quite weak, cooperation between companies is very difficult, etc. All these factors have restricted the development of the GIS industry, however, which provide a great opportunity as well as a challenge to the industry. In case that GIS companies can solve these problems, it will be very advantageous for the companies those can enter into the industry in the early time to establish good firm image, accumulate technology and bring up the customer's loyalty because of GIS industry's high technology barrier to entry, difficulty imitated experience and important learning curve.

6 CONCLUSION

Under the push of the market demand and government support, China's GIS industry made a great achievement: Not only in the technology level comparing with the oversea software, but also in the market share: China domestic GIS software takes a 35% share with a stable growth. How to accelerate the maturity of China's GIS industry chain and establish a strong GIS industry with international competitive advantage are the important tasks that all the GIS participants must face with in the next stage. In order to promote the fast health growth of the China's GIS industry, the following suggestions are offered to the different sectors in the industry.

6.1 Suggestions to the Government

After summing up experiences and achievement on policy guidance, R&D support, and technology orientation in the previous stage, the government should solve the problems of data copyright issue, the use of the data, redundant investment and construction through the farther construction of the national spatial infrastructure as soon as possible. Furthermore, it is very necessary for the government to regulate the market constantly, and realize the GIS standard unification as early as possible.

6.2 Suggestions to the GIS Companies

Firstly, the GIS companies should strengthen the comprehensive competitive ability and participate in the international competition actively. The leading GIS companies has already realized that it is very important to occupy the correct and dominant position on the industry chain as early as possible, and it is better to form a federation than cut-throat competition each other. Secondly, they should expedite the establishment the modern managing system and the introduction of the comprehensive management talents. Thirdly, on the basis that the government's demand is met, the companies should explore the new demand (i.e. new customers) from the society continuously, innovate continuously, and change direction from the governmental consumption to social consumption continuously. At last, the companies need to make great efforts to build a favorable competitive environment and gradually establish the self-discipline system and change the current disordered and vicious competitive situation. The rich, active industry cluster with Chinese characteristics should be formed under the leading GIS companies' impetus.

6.3 Suggestions to the other sections

After the warming up of GIS first developing period, it is a suitable moment for the investors to enter into GIS industry. Several leading GIS companies have been given great attention by international famous venture capital companies.

In conclusion, we can believe that there are plenty of opportunities for the China's GIS industry during the developing stage in the new century.

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