

## CHINA'S SOFTWARE INDUSTRY – CURRENT STATUS AND DEVELOPMENT STRATEGIES

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**Abstract:** Although software industry in China is still at the primitive stage, with her huge personnel resource, the demands from her fast growing economy, and government's promotional policies, China will inevitably become the main provider of software outsourcing services as well as the main software consuming market in the world. This paper focuses the discussion on four issues regarding China's software industry development: First, reviewing China's software industry development process in the past 10 years with an analysis with Yourdon's four-stage model; second, analyzing the software industry structure in China from three aspects: the market structure, the product structure, and the distribution of units according to their size; third, discussing the potential of China's domestic software market and software outsourcing services; and, fourth, proposing the strategies for China's software industry development.

### INTRODUCTION

China is emerging as one of major markets of software outsourcing services. According to the latest survey report released by Gartner, Chinese software outsourcing earnings is expected to catch up that of India in 2006 with the export of software development service to 27 billion dollars (ExpressIndia.com, 2002). If this trend continues, China will become a major competitor in the global outsourcing market (Thiagarajan, 2002). Besides this, China is also a software consuming market with a population more than 1.3 billion and more than 15,000 middle-size and small-size domestic firms, which are adapting to the world market particularly since China became a member of WTO.

In this research-in-progress paper, we focus our discussion on 1) China's software industry development process with the analysis using Yourdon's four-stage model (Yourdon, 1992), which has been used to evaluate the degree of maturity in the software export industry in India (Bhatnagar and Madon 1997); 2) The software industry structure in China from three folds, the market structure, the product structure, and the distribution of units according to their size; 3) The potential of China's domestic software market and software outsourcing services; and 4) The strategies for China's software industry development.

### THE ROAD OF CHINA'S SOFTWARE INDUSTRY DEVELOPMENT

The software development in the developed countries is increasingly relied on outsourcing to other countries with the considerations in cost, productivity and quality (Yourdon, 1992). Yourdon divides the software industry development into four stages: reputation building stage, which can be practiced as low value-added body shopping, i.e. sending low-cost programmers to work abroad to earn the reputation and the experience; onshore to offshore development stage, i.e. offshore customized software development; value addition improvement stage, which can be described as starting up offshore package development; product development stage, which can be described as total offshore product development (Bhatnagar and Madon, 1997). Although the software industry in China may still develop along the route as described in the Yourdon's model, but it does not necessarily follow the same growing pattern as other developing countries, such as India, because the technological and economic environments have changed much. It has taken India ten years to advance from stage 1 to stage 2 (Bhatnagar and Madon, 1997). Whereas, China's software industry may pass the earlier stages in a shorter time and enter higher stages promptly because of the increasing availability of advanced information technology achieved in the last decade, such as the Internet. Table 1 shows that the revenue of software industry in China has been increasing rapidly. The statistics indicates that China's software export has been tripled during 1999-2001, reaching about 750 million USD from 250 million USD two years earlier.

### CHINA'S SOFTWARE INDUSTRY STRUCTURE

The growth of software industry could be viewed from three aspects: the structure of software market, the composition of software products, and the software company distribution. According to Yourdon's model, a matured software industry exports its products. The more developed industry, the more diversified products. Currently, China's software market is domestic-oriented. Nearly 90% software products were sold in the local market.

However, it is remarkable that the growth of China's software export is at a rate of 80% in 2001. Heeks claims that if the software exports grows rapidly, the growth of the domestic market is prevented (Heeks, 1996). However, the situation in China is different. While the software export is growing, the sales in China's domestic software market are also increasing very fast.

Now China's software industry has started to provide more diversified software products, including platform software, middleware software, and application software which takes the first place because of China's huge domestic market. In recent 10 years, the shares of the system software, the maintenance software and the application software in the domestic market are 8%--15%, 21%--27% and 61--65% respectively (Table 2).

Table 1: The growth of software industry in China (1990 - 2001)<sup>1</sup>

Year	Total revenue of software services (million USD)	Total revenue of software products (million USD)	Annual growth rate of software products (%)	Exports of software (million USD)	Growth of exports over previous year (%)
1990	--	27	--	--	--
1991	--	56	100	--	--
1992	278	239	335	--	--
1993	593	484	100.	--	--
1994	701	593	22.5	--	--
1995	931	822	38.8	--	--
1996	1366	1112	35.5	--	--
1997	1790	1357	21.7	--	--
1998	2258	1668	23.2	--	--
1999	2878	2128	27.5	254	--
2000	3894	2878	35.2	399	57
2001	4903	3990	38.7	726	80

Table 2: The composition of software products in China (1992 - 2001)

Year	System software		Maintenance software		Application software	
	Revenue RMB10million	Proportion	Revenue RMB10million	Proportion	Revenue RMB10million	Proportion
1992	1.6	8%	5.4	27%	12.8	65%
1993	3.6	9%	10.8	27%	25.6	64%
1994	4.5	9%	13.2	27%	31.3	64%
1995	6.5	10%	15.0	22%	46.5	68%
1996	8.5	9%	20.0	22%	63.5	67%
1997	13.7	12%	27.5	25%	70.8	63%
1998	17.4	13%	35.9	26%	84.7	61%
1999	21.0	12%	44.8	25%	110.2	63%
2000	33.2	14%	49.6	21%	155.0	65%
2001	50.0	15%	81.9	25%	198.1	60%

Table 3: The growth of software companies in China

<b>Year 1999-2000</b>	The number of software companies	2000	The number of employees in software industry 150,000
	> 200 employees	8%	
	50—200 employees	42%	
	< 50 employees	55%	
<b>Year 2000-2001</b>	The number of software companies	7000	The number of employees in software industry 400,000
	> 100 employees	15%	
	50—100 employees	26%	
	< 50 employees	59%	

From Table 3, we can figure out that the numbers of Chinese software companies is more than tripled in last two years. However, nearly 60% of software companies are small-sized, usually with less than 50 employees. In a tough

<sup>1</sup> All data in the tables are compiled from the Bulletin of China Software Industry Association (2001), CCID (2001) and Computer World (2000)

international software outsourcing market, it is hard for small Chinese software companies to conduct stable businesses and to compete with those experienced and powerful rivals. It will take some time for Chinese software companies to play main roles in the market.

### **CHINA: THE SOFTWARE OUTSOURCING MARKET WITH A HUGE POTENTIAL**

Comparing India with China, we can further realize the strengths of China as an outsourcing destination. One of the important strengths of China is its huge domestic software market that attracts domestic software firms as well as foreign software firms. Especially, on her accession to WTO, China will promote social and economic development through the wider use of information technology. Second, China has absorbed foreign direct investment (FDI) many times than that by India. Now, owing to its huge domestic market, sustained economic growth and political stability, the new membership of WTO, China is becoming the hottest spot for FDI, even more than that the United States (Laudicina, 2002). A significant part of the FDI flows is going into the China's IT sector, specifically in recent years, the software industry. Third, the information and telecommunication infrastructure of China is superior to that of India. While every 100 Chinese people own 20 telephones and there are 45.8 million Internet users in China, India has just three telephones for every 100 people and only 2 million Internet users out of a population of 1 billion. Fourth, compared with India, the political and social environment of China is more stable, which will give the investors and enterprises more confidence and can support software industry growth in a long run. Fifth, a remarkable competitive advantage is the lower cost of manpower in China, which is one of important factors that lead to software outsourcing (Youdon, 1992). Moreover, China has been enacting attractive policies for the software industry and the IT sector, such as preferential invest policies, tax concessions, favorable software export policies, policies of distribution of income, the certification for the software companies and products, policies of intellectual property rights, policies of management and organization of software industry.

However, in some aspects, such as quality control processes, communication/culture, India is far ahead of China. From the mid-1980s, India was already at the first stage of development of software industry long time ago (Bhatnagar and Madon 1997). Now India software industry is at the third stage and is referred to as "the world's back office" (Lappin, 2002). With the reputation and credentials built in past years, many Indian software companies are winning much more complex businesses and outsourcing contracts.

We present the following suggestions to the Chinese government policy makers and the players in the software industry for promoting China's software industry:

- 1) Speed up the infrastructure construction. The development of software is closely relevant to the level of infrastructure construction. Although China has achieved a great improvement in the infrastructure construction, with a population of 1.3 billion people, the subscription rate of Internet and telephone is still low in comparison with that in development countries. To maintain the growth of economy and promote the development of software industry and IT sector, China must constantly enlarge its network infrastructure construction and expend the service of telecommunications. More importantly, the Chinese government needs to provide financial and other inducements to get businesses to re-engineer their business processes to take advantage of the Internet.
- 2) Build a consistent legal system. In China, software piracy is rampant. Moreover, when Chinese software companies enter the global outsourcing market, the outsourcing contracts will raise many legal problems that should be considered in the international context. During the past couple years, the Chinese government has made efforts to eliminate piracy and has promulgated new regulations on software use. However, building a consistent legal system is still the top priority for China to ensure the development of software industry.
- 3) Continue to enlarge the investment to general education and professional training. In today's outsourcing market, cost is still the most important factor driving customers to outsource their software projects. China needs to train more workers with so they have the expertise to be employed in software companies. (Ju, 2001). In particular, there is a shortage of people with skills in both management and computer science. In term of education, The Chinese government in coordination with China's universities should develop joint programs in management and computer science.
- 4) Increase the quality and process maturity. For subcontracting companies, it is important to increase the quality and process maturity in order to meet the demand of the outsourcing providers. Chinese software

companies need to adopt the advanced project management concepts for their businesses. As the domestic software market is gradually merging to the international market, the demand from the domestic market will raise the same requirements as that from the international market. This will eventually push Chinese software companies to align their project management to the world standard. The government needs to do research on the best development software methodologies for Chinese firms. It needs to explore whether Capability Maturity Model (CMM) certification, and what level of CMM, should be pursued by Chinese firms. In this context, there needs to be research on new methodologies for software development such as Agile and Extreme Programming.

- 5) Build the correct channels to the global outsourcing market. There are two ways to connect the outsourcing providers with the qualified software companies in China. One is that the software companies go abroad to build their representative units or subsidiaries in the target markets such as the US. Another way is that Chinese government and software companies attract the foreign providers by preferential policies and the elimination of red tape.
- 6) Cooperate with India while competing each other. The Chinese government should encourage joint ventures between Indian and Chinese companies. There is much that Chinese firms can learn from Indian firms. At the same time, Indian firms should be given access to the vast domestic software market.

## CONCLUSION

Although software industry in China is in its infant stage, it is growing rapidly. With China joining The World Trade Organization and its global image makeover, Chinese software companies will be strong competitors in the software outsourcing market. Although the economies in America and European are in a recession, the demand for software outsourcing is continuously increasing as companies struggle to reduce costs. The Chinese government, its businesses, and its universities need to work together to develop the outsourcing market in China.

From research aspect, there are several issues to be explored in depth. First, how to conduct an effective cooperation between China and India in software industry. Second, the question of whether Chinese companies should invest in CMM certification and what CMM level they should shoot for should be addressed. Behavioral research is needed to shed light on the managerial issues. Third, as open source software (OSS) is getting more attention in China, there needs to be an exploration of how to build viable business models that take advantage of OSS. The potential of the Chinese software industry to build software for both domestic and international use is vast, but it will take government leadership to make sure that China realizes this potential.

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