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STRATEGIC CHALLENGE, STRATEGIC RESPONSES, AND STRATEGIES: STUDY OF CHINESE STATE-OWNED ENTERPRISES

Jifu Wang

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STRATEGIC CHALLENGE, STRATEGIC RESPONSES, AND STRATEGIES:

STUDY OF CHINESE STATE-OWNED ENTERPRISES

Except where references is made to the work of others, the work described in this dissertation is my own or was done in collaboration with my advisory committee.

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DISSERTATION ABSTRACT

STRATEGIC CHALLENGE, STRATEGIC RESPONSES, AND STRATEGIES:

STUDY OF CHINESE STATE-OWNED ENTERPRISES

Jifu Wang

Doctor of Philosophy, August 6, 2001
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(MBA, Emporia State University, May 1997)

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The purpose of this study is to identify the dominant challenges and forces for change to State-Owned Enterprises in China (SOE), the nature of SOE responses to those forces, and the degree of SOE success in making the necessary transformations to compete in a global business environment.

Five questions were explored and examined in this dissertation research. 1) What factors create strategic challenges to SOEs? 2) How have SOEs responded to a more market driven environment? 3) What factors determine the strategies of the SOEs? 4) What new business processes and structures have SOEs planned and implemented? 5) How do SOEs measure the performance of their new strategies?

The investigation was carried out using case study methodology. Eight companies in seven industries were studied of which six were used for this dissertation. A holistic conceptual model for SOE study has been developed based on the framework derived from Hofer's preliminary research. This model, which is built on the concept of business strategy, summarizes the findings of this study, and has proved to be an effective analytic tool in studying the patterns of strategic behaviors of SOEs in China's dynamic environment of economic, social and industrial transformations. The major contribution of this model is that it takes the holistic view, and studies the developments in strategic behaviors at a macro level. Even though the variables in the model can change and their significance can vary at different stages of change, the model provides theoretical guidance in research in emerging economies, and can catch the dynamics of change. The beauty of this model lies in its simplicity in logic flow and practicality in application.

State-owned enterprises (SOEs) in China are its dominant economic organizations. 1) Among 305,000 SOEs, 118,000 are industrial firms that provide the basic inputs for the economy, provide employment and social welfare for the vast majority of China's urban workers, and provide the bulk of fiscal revenues for most governmental levels. 2) SOEs account for 35-40 percent of the nation's gross national product and 60 percent of all state revenue. 3) SOEs constitute the nation's entire heavy industrial base.

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The author would like to express sincere appreciation to the members of my dissertation committee, Dr. William Boulton, Sharon Oswald, and Peter Stanwick for their continuous support, guidance, and expertise. I am always proud to recite their names when I talk about my dissertation and my life at Auburn University.

Dr. Boulton's scholarly vision and guidance has made this document much better and has helped me grow as a scholar and researcher. His leadership has provided me a stability that might have otherwise been absent in a situation in which I was on the other part of the planet, collecting research data. He spent so much time in helping me out, and actively provided me any help that I needed. Dr. Sharon Oswald functioned as my mentor in teaching strategic management. She was kind and helpful. Without her help, I would not become the person I am today. My whole family was indebted to her for her kind concern and support. Dr. Peter Stanwick often inquired about my dissertation progress. His insights in my dissertation proposal defense were very helpful. Dr. Butler, an expert in marketing, has given me enthusiastic help with my dissertation.

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CHAPTER I: INTRODUCTION

China is an important nation that portends to become the world's largest economy during the new millennium. In purchasing power parity, China is already the world's second largest economy behind the United States, touting the world's largest population base of nearly 1.3 billion people. Behind the United States, it is the most appealing market for attracting foreign direct investment. Yet, its most critical challenge is to complete a transition of its centrally controlled economy to a market driven economy. This transformation puts the greatest pressure on the government's state-owned enterprises (SOE), which must learn to compete in an increasingly open and competitive world. With China's planned entry into the World Trade Organization, SOEs had little time to prepare for outside competition. Cutting them loose from state control, and making them competitive with the outside world was one of the government's top priorities. The purpose of this dissertation is to analyze the transformations of China's state-owned enterprises as they move to becoming corporations capable of competing in a global market-driven economy.

China's Growing Importance

There is little question that China is one of the world's most important nations. However, confusion often came in attempting to classify China as a developing country. The actual size of the Chinese economy has been a subject of extensive debate among economists. Measured in U.S. dollars using nominal exchange rates, China's GDP in 1998 was $948

billion, and its per capita GDP (a commonly used figure to measure and compare a nation's living standard) was $769. Such data would indicate that China's economy and living standards were significantly lower than those of the United States, Japan, and Germany. In nominal U.S. dollars, China's 1998 GDP was about 45 percent the size of Germany's, 23 percent that of Japan's, and 11percent that of the United States. China's nominal per capita GDP was only 2.4 percent that of the United States (see Table 1).[1]

Many economists, however, contend that using nominal exchange rates to convert Chinese data into U.S. dollars substantially underestimated the size of China's economy. This was because prices in China for many goods and services were significantly lower than those in the United States and other developed countries. Economists attempt to factor in these price differentials by using a purchasing power parity (PPP) measurement, which attempts to convert foreign currencies into U.S. dollars based on the actual purchasing power of such currency (based on surveys of the prices of various goods and services) in each respective country. This PPP exchange rate was then used to convert foreign economic data in national currencies into U.S. dollars.

Because prices for many goods and services were about one-sixth the price in China as in the United States and other developed countries (while prices in Germany and Japan were higher than those in the United States), the PPP exchange rate raised the estimated size of the Chinese economy to $4.6 trillion, higher than Japan's GDP in PPP ($3.0 trillion) and Germany's ($1.6 trillion), and slightly over half the size of the U.S. economy (see Table 1). PPP data also raised China's per capita GDP to $3,701; however,

---

[1] Wayne M. Morrison, China's Economic Conditions, *Foreign Affairs, Defense, and Trade Division, National Council for Science and the Environment, December 1, 1999*

this figure still fell far below the PPP per capita GDP levels of major developed countries and was only 12 percent of U.S. levels.

Table 1. Comparisons of U.S., Japanese, German, and Chinese GDP and Per Capital GDP in Nominal U.S. Dollars and PPP: 1998

Country	Nominal GDP (SBillions)	GDP in PPP (SBillions)	Nominal Per Capita GDP	Per Capita GDP in PPP
U.S.	8,500	8,500	31,414	31,414
Japan	4,190	2,969	29,860	23,228
Germany	2,109	1,637	26,024	21,376
China	948	4,610	769	3,701

Source: DRI/McGraw Hill. *World Economic Outlook*, Volume I 1st Quarter, 1999, p. A-27.
Note: PPP data for China should be interpreted with caution. China is not a fully developed market economy; the prices of many goods and services are distorted due to price controls and government subsidies.

While PPP data rank China's economy as a whole as the world's second largest, its living standards were quite low. To illustrate, the World Bank estimated that nearly 30 percent of China's population lives below the international poverty level of $1 per day. The International Monetary Fund estimated that (using PPP measurements) China could surpass the United States as the world's largest economy as early as the year 2007. Yet, even if that were to occur, it would take China significantly longer to achieve U.S. standard of living levels.

In the early nineties, China became the leading exporter to the United States of 11 different product groups. The U.S.'s deficit with China was the second largest on record, following only Japan, and predicted to surpass Japan's U.S. trade deficit as it markets opened (Kelley & Luo1999). China's open market reform and rapid economic growth have enticed a tremendous surge in activity and market investment by multinational

companies. The U.S. was the third biggest investor in China after Hong Kong and Japan (Zhao & Culpepper, 1997). One study showed that 72 percent of American investment contracts in China involved equity joint ventures (Beamish, 1993). Growth in the number of equity ventures between U.S. and Chinese firms had been exponential in recent years.

China was second only to Japan as Asia's largest and fastest growing market for most products. Real growth in gross domestic product (GDP) averaged 9.7 percent per year since 1981 and hit over 10 percent during ninth five-year plan. By early in the twentieth century, China's consumer market will be larger than that of the United States or Western Europe. This is largely due to the pragmatic and rapid economic reforms and unabated opening to the outside world.

China's Economic Reform in 1978

Reforms in China spurred an economic response that continues to astound the world. Several factors made the Chinese economy ripe for the change that began in 1978 (World Bank, 1997).

First, China was ready for reform. The economic disruption of the Cultural Revolution, and before that of the Great Leap Forward, had caused a decline in economic conditions. In 1978, real incomes in rural areas had been stagnant for more than a decade. The country was running short of foreign exchange to purchase essential imports. The widening technological gap between China and the rest of the world had become too large to ignore. Perhaps more important, China's neighbors in East Asia had

demonstrated the potential for growth when high-saving economies adopted market principles.

Second, in China more than two-thirds of the population lived in the countryside. For them, the uncertainties of reform were less alarming than the difficulties of the present system. They had no income guarantees and, despite rising agricultural yields, their average incomes had barely grown for more than two decades. And agriculture's surplus labor meant that rural industry could achieve rapid, uninterrupted growth for almost two decades without facing wage pressures.

Third, planning was less entrenched in China than in other transition economies. For example, in the 1970s, the Soviet Union's government agencies centrally allocated about 60,000 different commodities through their plan. In China the number was about 600 in 1978, unchanged from 1965 (Naughton, 1995). Not even the most determined planners could oversee an economy of the size and complexity of China's. Even at the height of planning, China had about 30,000 rural markets operating, albeit with restrictions (Naughton, 1995). Smuggling was rife. So when commercial activities were legalized, Chinese enterprises needed little encouragement to expand.

Fourth, China had a strong administrative capacity, especially at the provincial level. Over the centuries, China had developed a sophisticated system of local government to raise revenues and store grain as insurance against famine (Will and Wong, 1991). This tradition of local government became stronger under communist rule. So when reforms required administrative and financial decentralization, provincial governments were able to take on the new responsibility. Moreover, the central

bureaucracy, severely weakened in the throes of the Cultural Revolution, quietly acquiesced to the shift on economic power away from the center.

Fifth, China had a skilled disciplined labor force. Despite disruptions to education during the Cultural Revolution, literacy was high by the standards of most developing countries. The average worker had 3.6 years of primary education, almost half a year more than the developing country average of 3.2 years (Nehru, Swanson, & Dubey, 1995). A relatively large portion also had secondary education. The share of technicians and engineers in the industrial labor force was higher than in many newly industrializing economies of Southeast Asia.

Finally, the Chinese diaspora extended to virtually all corners of the world. Chinese minorities in several Southeast Asian countries had considerable economic power, and they figured prominently in the explosive growth of foreign direct investment in China. But the Chinese diaspora brought more than money; it also contributed commercial expertise, knowledge of foreign markets, new approaches to management, new ideas on economic policies, and the latest labor-intensive technologies.

Driving Forces for China's Economic Growth

China's remarkably rapid growth since 1978 has been driven by three forces (World Bank, 1997):

1. A high and stable savings rate supported vigorous rates of investment and capital accumulation. According to official statistics, China's savings rate averaged 37 percent of GDP between 1978 and 1995 (World Bank, 1994), among the highest

in the world. Even as reforms and structural change were reshaping the economy, the Chinese savings rate was remarkably stable. This stability of the high savings rate supported the reform path chosen by the Chinese.

2. Structural change has been both a cause and an effect of growth. In eighteen years since 1978, China's agricultural labor force dropped from 71 percent to about 50 percent. It took the United States fifty years and Japan 60 years to achieve a similar structural shift. Low incomes from farming and widespread poverty in rural area encouraged farmers and their families to leave. At the same time, the demand for labor increased sharply in industry and services sectors that achieved rapid productivity growth. This labor force migration facilitated the transformation from state-owned enterprises to collectively-owned township and village enterprises, and to privately and individually owned enterprises, supplemented by joint ventures and foreign-funded enterprises. This structural transformation has given an extra boost to China's growth over the past eighteen years.
3. The economic reforms in 1978 were triggered neither by economic crisis nor ideological epiphany. Pragmatic and incremental reforms enjoyed broad support. The country had endured much hardship over the previous two decades, with the start of the Great Leap Forward in 1958 through the Cultural Revolution in 1966. Against this tumultuous backdrop the years leading up to 1978 were relatively tranquil. Growth in economy and improvements in living standards became the major objectives for the Chinese leaders, who at first lacked experience and set

moderate objectives. In 1979, for example, the government called for "a planned economy supplemented by market regulation." With success, they became more ambitious. By 1993, the goal had matured to the creation of a "socialist market economy with Chinese characteristics."

China's Development Problems

China is in the throes of two transitions: from a command economy to a market-based economy, and from a rural, agricultural society to an urban, industrial one. So far both transitions have been spectacularly successful. China is the fastest growing economy in the world, with per capita incomes more than quadrupling since 1978. In two generations China has achieved what took other countries centuries. For a country whose population exceeds that of Sub-Saharan Africa and Latin America combined, this has been a most remarkable development (World Bank, 1997).

However, swift growth and structural change, while resolving many problems, have created new challenges: employment insecurity, growing inequality, stubborn poverty, mounting environmental pressures, and periods of macroeconomic instability stemming from incomplete reforms. Unmet, these challenges could undermine the sustainability of growth, and jeopardize China's future developments.

Problem 1: Employment Insecurity

At the turn of the century, urban SOEs (state-owned enterprises) had some 20 to 30 million latently unemployed workers. In the countryside, surplus labor forces of about 100 million were in need of employment. In China's tenth five year plan, 80 million new

jobs were needed to handle the estimated 40 million workers expected to migrate from agricultural jobs, plus an additional 40 million workers expected to be displaced from SOE restructuring. The surge of farmers crowding into the cities each year after the Spring Festival already overwhelms the large cities and makes it extremely difficult to maintain social order.

Problem 2: Economic Structure

The current Chinese economic structure leans heavily on processing industries, which are expanding very rapidly, while energy resources, transportation, and the infrastructure lag far behind. These factors place major restraints on the continued rapid development of the national economy.

Problem 3: Differences between Urban and Rural Areas

Since the start of reform, both the countryside and cities have been developing, and the standard of living has been on the rise. However, the cities have developed much faster than the rural areas, and as a result, the disparity in incomes and living standards between the two and between the industrial workers and farmers has increased sharply in recent years.

Problem 4: State-Owned Enterprises

The new policies put great pressure on state-owned enterprises, which had been the mainstay of the economic system before 1978. Controlled by the bureaucracy and operated with state subsidies for decades, many lacked the ability to adapt to external changes or innovate to survive. With reforms, SOE's dependence on public subsidies

began to increase. The government's desire to contain its own budget deficit caused the state banking system to provide the necessary financial support.

Beginning in 1980 many enterprises acquired increasing autonomy over their operations. New freedoms included a slowly rising share of profits that could be retained for wage bonuses and new investment, greater autonomy over production decisions and wages, adoption of the "management responsibility system" (seen as a counterpart to agriculture's household responsibility system), and in some cases recruitment of new management. Central and local governments usually negotiated these new freedoms firm by firm. As a result, the operational environment varied enormously between firms, across regions, and across sectors. In 1984 the Enterprise Bill of Rights formalized these changes and created an additional impetus for growth.

The increased autonomy of state enterprises allowed them to benefit from China's dual-track pricing system, also introduced in the early 1980s. Under this system planners typically set a price for a commodity but allowed all above-plan output to be sold at market prices. Since the volume of planned output barely changed, enterprises sold more and more in the open market. Thus all growth and development occurred at market prices, which almost certainly improved resource allocation. Because no enterprise was made worse off, the reforms received enthusiastic support. Today more than 95 percent of industrial output is sold at market prices.

The decentralization of management decisions boosted the productivity of firms. But relative to the rest of the economy, state enterprises languished, with slow growth and declining profits. In part this was because state enterprises, unlike their nonstate

competitors, were required to provide job security and a range of social services, such as housing, education, and health care. Yet slacking performance also reflected a deeper malaise rooted in the poor investment decisions of the past and in an "iron rice bowl" system that did not penalize low productivity.

More recently, however, lower subsidies, tighter credit, and growing competition have begun to unmask the inefficiency and poor financial condition of many state enterprises, which are deep in debt and short of working capital, prompting new approaches to enterprise reform, especially at the local level. Examples include mergers, leases, incorporation, management contracts, worker and management buyouts, and bankruptcies. At the same time, the central government is focusing on reforming and revitalizing 1,000 (from more than 100,000) state-owned industrial firms that will form the core of China's modern enterprise system.

The Importance of China's State-Owned Enterprises

China had 305,000 state enterprises, 118,000 of which were industrial (World Bank, 1997). These enterprises were the firms that provided basic industrial inputs for the economy, employment and social welfare for the vast majority of China's urban workers, as well as the bulk of fiscal revenues for most governmental levels (Steinfeld, 1998). SOEs are a big player in national economy, accounting for 35-40 percent of the nation's gross national product and 60 percent of all state revenue. They constitute virtually the nation's entire heavy industrial base: steel makers, machine builders, auto and truck manufacturers, and petroleum producers. Statistics showed that 50 percent of the firms in Chinese industry were SOEs, without considering firms below the township level (Gao &

Chi, 1997). SOEs are typically monopolies in backbone industries of the national economy such as infrastructure, energy, transportation, and public utilities.

Studying the Transformation of SOEs

This dissertation focuses on Strategic Challenges, Strategic Responses, and Strategies for success in state-owned enterprises (Figure 1). Currently, the transformations of SOEs and their structural readjustments have reached a critical stage, filled with deeply rooted philosophical contradictions and management problems. The majority of SOEs have not yet adapted to the demands of the market economy due to long-term influences of the traditional centralized system. Redundancies, stagnation, and obsolescence of operations are causing firms to go out of business, generating new problems of unemployment and welfare. They lack flexibility in terms of structural change, are weak in technological innovation, have a large number of surplus employees, and have inefficient production and business operations. This research investigated these problem areas and attempts to identify how leading firms are overcoming such problems.

Officials at representative SOEs involved in China's National High Tech 863 programs were interviewed to identify how they successfully initiated strategic change, how they achieved their goals in terms developing competitive product, and how they had to change their policies and procedures to achieve the fit among the structure, strategy and culture. The history and experiences of individual firms were described, and collectively, a model of strategic transformation of Chinese SOEs was developed. The results are intended to be helpful to managers, researches and policy makers.

Research Questions

This research was directed at identifying successful strategies for transformation. It assumed that the purpose of China's reforms was to create modern, competitive corporations. The research described the objectives for SOE reforms and resulting development in

1) Revising strategic direction and structure;

2) Responding to a changing market and competitive environment;

3) Establishing modern corporate systems;

4) Improving economic performance;

5) Strengthening the capacity of scientific and technological development.

The rationale for defining the research question is the same as it is in hypothesis-testing research (Eisenhardt, 1989). Specifically, the following five questions were explored and examined in this dissertation research.

1. What factors create strategic challenges to the company?
2. How has the company responded to a more market driven environment?
3. What factors determine the strategies of the company?
4. What new business processes and structures have been planned and implemented?
5. How do you measure performance of the new strategies?

Until now, no researchers have used the Strategic Response Model (Figure 1) to study the reforms for Chinese SOEs. Synthesizing knowledge and theory from a variety of sources, this study created a conceptual framework of strategic behavior in SOE transformations.

Source: Hofer (1973)

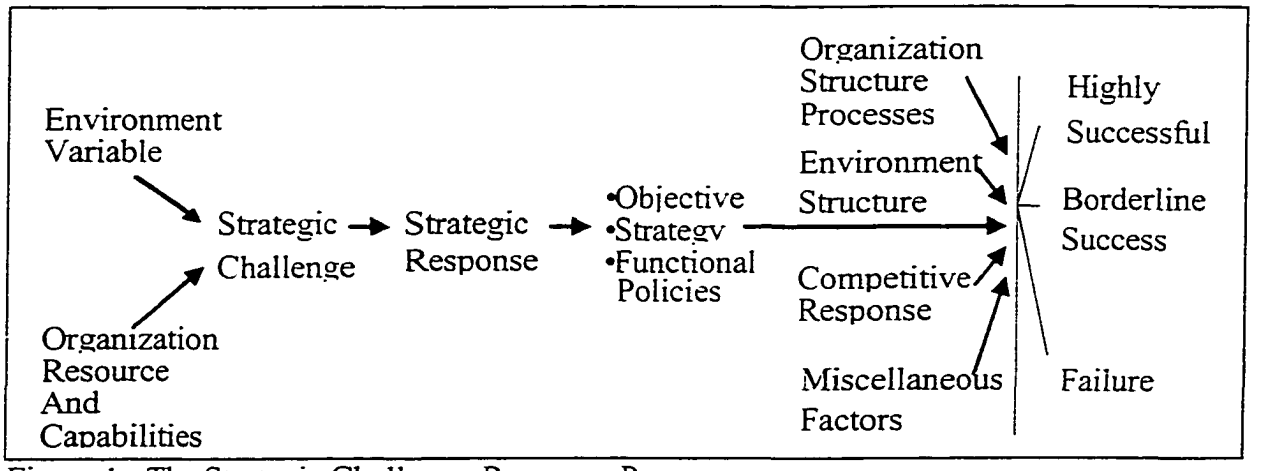


Figure 1. The Strategic Challenge-Response Process

Structure of the Dissertation

In Chapter II, the Literature Review introduces previous literature on the concept of strategy, strategy classifications, and business strategy components. Then strategic challenges for emerging market economies such as China are reviewed in terms of the Institutional Perspective, Resource-Based Perspective and Transaction Cost Economics Perspective. And lastly related strategic responses were investigated.

Chapter III is primarily concerned with the research methodology used for this study. It addressed potential problems in conducting research in a China. It also discussed the merits of case research in such an environment.

Chapters IV to IX describe the case studies of Chinese SOEs included in this research. Each study was a substantive investigation of the research questions, which taken together, served to highlight the flexibility and capabilities of the response model.

Chapter X provides the analysis of our research in addressing the research questions. It analyzed the dominant challenges and forces for change, the nature of SOE

responses to those forces, and the degree of success they were having in making the necessary transformations to compete in a global business environment.

Chapter XI provides the conclusions and implications for managers, policy makers, and future research requirements.

CHAPTER II: LITERATURE REVIEW AND RESPONSE MODEL

What is Strategy

As Markides (1999) pointed out that there is surprisingly little agreement on defining strategy regardless of the obvious importance and decades of academic research of the topic. The term strategy has more frequently been employed with business (Clampitt, DeKoch, & Cashman, 2000). A long and intellectually stimulating history has generated both controversy and understanding (Mintzberg, Ahlstrand, & Lampel, 1998).

After assessing the broad range of strategy definitions in previous literature, Hofer and Schendel (1978) found that there were major disagreements in three major areas: 1) in the breadth of the concept of strategy i.e. whether the strategic concept should include both the goals and objectives of a firm along with its means to achieve these ends; 2) in the classifications of strategy, and 3) in the components included in strategy. In the following section, strategic concept, strategy classification and business strategy components will be reviewed from the prior theories and research.

Concept of Strategy

The term strategy, which was derived from Greek *strategos*, originates from the military and is loosely deciphered as "art of the general" (Gomez-Mejia & Balkin, 1992). Generals are concerned with the big picture. Strategy typically occurs at higher

organizational and abstraction levels (Clampitt, DeKoch, & Cashman, 2000). In the following section, some of the works concerning strategy from the influential researchers and scholars were studied and the specific definition of it was made for this dissertation.

In his 1962 classic work, Strategy and Structure, Chandler, who provided groundbreaking research in the field of strategy, clearly defined the concept of strategy based on the historical development of corporate strategy and structure in the U.S. by studying innovations in business administration between the years of 1850 – 1950. He defined strategy as "the determination of the basic long-term goals and objectives of an enterprise, and the adoption of courses of action and the allocation of resources necessary for carrying out these goals". Chandler argued that a change in a firm's strategy eventually causes a change in its structure and that the common denominator of strategy and structure is the reallocation of the enterprise's resources to meet changing market demands. Chandler focused on the executive activities such as long-term decision-making, investment decisions, and structural modifications to support strategies at General Motors, Sears, Standard Oil and Dupont.

Chandlers' work had a strong impact not only on the work of other scholars in the field (Ansoff, Ackoff, Williamson's transaction cost theory, Wrigley-Rumelt's diversification, Galbratih's organizational fit, and Armout and Teece's tests of the transaction cost hypotheses), but also on practitioners and researchers concerned about the strategic activities of executives and top management teams. The concept of strategy used in this study is consistent with Chandler's view.

Ansoff in his book Corporate Strategy (1965) provided the practical method for strategic decision-making within a business firm. He viewed strategy as "an operator which is designed to transform the firm from the present position to the position described by the objective, subject to the constraints of the capacities and the potential" (p.205). His approach was much more programmatic than Chandler's, and was more concerned with the process of strategic planning than its outcome.

Ansoff argued that the objective for the firm was to maximize economic return and that effective strategy had five components: 1) product-market scope, 2) growth vector (the direction in which the scope was changing, 3) competitive advantage (primarily in the market place), 4) combinations of capabilities or competencies that created internal synergies, 5) the importance of the "make or buy" decision. The conceptual framework of this dissertation draws on Ansoff's framework on his first and second components.

In The Concept of Corporate Strategy (1971), Andrews discussed strategy in terms of its formulation and implementation. He sought to understand how policy decisions are made through the analysis of hundreds of case studies. The formulation phase consisted of identifying economic/market opportunities, distinguishing corporate competences, recognizing personal values and aspirations, and considering obligations to society. Specifically, strategy formulation involved answering the four basic questions: 1) What we might do (identifying environmental opportunities and risks); 2) What we can do (identifying firm resources and distinctive competences): 3) What we want to do

(examining personal values and aspirations), and 4) What we should do (examining social responsibilities).

The implementation phase focused first on the organization structure and relationships. Andrews believed that structure followed strategy requiring a subdivision of divided responsibility and coordination of divided responsibility, and an effective design of information systems. Implementation also included establishing appropriate organizational processes and behaviors. This entails establishing standards and measures of performance, the use of motivation and incentive systems, operation of restraints and control systems, and recruit and development of management. Finally, the top management team must act as the architect of strategy, organization leader and personal leader.

Andrews defined corporate strategy as:

> "... The pattern of decisions in a company that determines and reveals its objectives, purpose, or goals. produces the principal policies and plans for achieving those goals, and defines the range of business the company is to pursue, the kind of economic and human organization it is or intends to be, and the nature of the economic and noneconomic contribution it intends to make to its shareholders, employee, customers, and communities" (1980, p.18).

Mintzberg (1987) suggested five contexts in which the term strategy may be applied. Strategy serves as plan, a consciously intended course of action made in advance of the actions to which they apply stated explicitly in formal documents known as plans. Strategy can function as ploy, which is a specific maneuver intended to outwit

an opponent or competitor. Strategy can work as a position, which indicates an action or set of actions an organization takes to achieve an objective, for example to outwit an opponent or to occupy a niche in a marketplace. Strategy can be described as a pattern, showing a stream of actions or results with consistency in behavior, whether or not intended. Lastly, strategy can be defined as perspective, a shared viewpoint that creates commitments to a way of acting and responding.

Tregoe and Tobia (1991) defined strategy as vision, what an organization wants to be, which is the framework guiding the choices that determine the nature and direction of an organization. These choices relate to the scope of a firm's products, markets, key capabilities, growth, ROI, and allocation of resources.

Phelan, (1997) defined the term of strategy a consciously intended course of action to achieve some goal or objective. A strategy is made in advance of the actions to which it applies and is often stated explicitly in a formal document known as a plan.

Clampitt, DeKoch, & Cashman, (2000) broadly define strategy as "the macro-level choices and tradeoffs executives make, based on their organizational goals and judgments about others' reactions, which serve as a basis for action."

Thus, from notions of "strategy as positioning" to "strategy as visioning", various possible definitions for strategy are fighting for legitimacy (Markides, 1999). Using Hofer and Schendel's concept of strategy (1978), Chrisman, Hofer and Boulton (1988) advocated that "a strategy describes the fundamental characteristics of the match that an organization achieves among its skills and resources and the opportunities and threats in its external environment that enables it to achieve its goals and objectives." This

definition provides the centerpiece for this dissertation because it is consistent both with the needs of contingency theory and with the views of most scholars in the field of strategic management (e.g., Andrews, 1971; Ansoff, 1965; Ohmae, 1982; Porter, 1980; Schendel & Hofer, 1979).

Classification of Strategy

Classification is the development of a system or schema that helps researchers arrange entities into taxa based on their similarities, differences, and relationships to one another as determined by or inferred from their most fundamental characteristics (Chrisman, Hofer & Boulton, 1988; Mayr, 1982; McKelvey, 1982). Thus, the classification system is useful for identifying both the past and future strategies followed by organizations.

Chandler (1965) identified four types of strategies: 1) expansion of volume, which leads to creation of an administrative office to handle one function in one area, 2) growth through geographic dispersion, which yields the need for departmental structure and headquarters to administer several local field units, 3) expansion into new types of functions (vertical integration), which calls for building a central office and multi-departmental structure, and 4) developing new lines of products and expanding national/international growth, (where diversification accounts for most of the changes), which leads to formation of decentralized, multidivisional structures with a general office to administer different divisions.

Schendel and Hofer (1979) classified strategy into three major hierarchies: corporate strategy, business strategy and functional strategy. They explained:

> Corporate strategy addresses the question, "What business(es) should we be in?" It also focuses on the ways that the different businesses a firm chooses to compete in should be integrated into an effective portfolio .... Business strategy deals with the question, "How should a firm compete in a given business?" That is, how should it position itself among its rivals in order to reach its goals? Functional area strategies also address two issues. First, they are intended to integrate the various sub-functional activities in the firm. Second, they are designed to relate the various area policies with changes in the functional area environments (p.12 – 13).

Hofer and Schendel (1978) pointed out that classification of strategy into three different levels helped both in identifying the components of strategy and in formulating strategy. In this dissertation study, the focus of strategy analysis will be on the business level.

Components of Business Strategies

Strategic management scholars and researchers have advanced numerous strategy components in an attempt to describe the nature of the "match" that strategy represents. The common business strategy components frequently seen in literature include investment intensity (Hofer & Schendel, 1978), scope or domain (Abell, 1980; Ansoff, 1965; Buaron, 1981; Galbraith& Schendel, 1983, Hofer & Schendel, 1978; Porter, 1980; Yavitz & Newman, 1982), growth vector (Ansoff, 1965), distinctive competences or resource deployments (Galbraith & Schendel, 1983, Hofer & Schendel, 1978), types of

competitive weapons (Buaron, 1981; Porter, 1980), types of competitive or differential advantage (Ansoff, 1965; Galbraith & Schendel, 1983; Hofer & Schendel, 1978; Yavitz & Newman, 1982), segment differentiation (Abell, 1980), (h) synergy (Ansoff, 1965; Hofer & Schendel, 1978), and timing (Yavitz & Newman, 1982).

However, researchers are gradually recognizing that competitive advantage and synergy are characteristics (or outcomes) of effective strategies and not components that describe the strategies themselves (Chrisman, 1986; Hofer, 1985). Additionally, there are overlaps among several of the other strategy components. For example, Hofer and Schendel's "distinctive competences" describes the internal organizational skills and resources that determine the external competitive weapons (Porter, 1980) that organizations use to attain competitive advantage. Likewise, Ansoff's growth vector is a combination of the scope and timing components proposed by others. Hofer and Schendel, Porter, and Abell, however, incorporate timing into their scope and resource deployment/competitive weapons components by looking at both their present positions and planned moves. Thus, after eliminating overlaps and duplication, we are left with four major strategy components: (a) investment intensity, (b) scope, (c) segment differentiation, and (d) types of competitive weapons. And of these, only scope, segment differentiation, and types of competitive weapons are needed to describe an organization's competitive business substrategy.

Thus, following Hofer and Schendel (1978) and Abell (1980), the scope is defined as the configuration of an organization's interactions with its environment that describes its domain of action. And following Porter (1980, 1985), competitive weapons

are viewed as the primary ways the organization applies its skills and resources to meet environmental needs and create enduring competitive advantages. Finally, following Abell (1980), Sandberg (1986), and Chrisman (1986), segment differentiation will be considered as the use of different types of competitive weapons in different market segments.

Environment

Early literature in this field focused on the environment of decisions rather than the environment of organization (Barnard, 1938; Simon, 1945; Selznick, 1957). Barnard (1938) in his study emphasized the decisional world, social world, the external things and forces and circumstances of the moment. He explained that purpose was viewed as being essential to give any meaning to the environment. Thus purpose and environment interact through successive decisions to generate more detailed descriptions of purpose. Barnard divided environment into two parts, "the facts that are immaterial, irrelevant, mere background and the part that apparently aid or prevent the accomplishment of purpose."

Selznick (1957) talked about the institutionalization of an organization as a process of adapting to its environment through internal strivings and external pressure. Simon (1945), by contrast, was concerned with the psychological impact of factors on the efficiency of the decision making process. According to these authors, environment consisted of two dimensions: 1) the internal environment that was made up of relevant physical and social factors within the boundaries of the organization, and 2) the external

environment that was composed of relevant physical and social factors outside the boundaries of organization (Duncan, 1972a).

Ever since system concepts gained paradigmatic centrality, organizations have been conceptualized and researched as open systems engaging in transactions with their environments (Bourgeois, 1980). Chester Barnard (1938) was one of the first researchers who recognized the system properties of organizations. Dill (1958) in his pioneering study defined the components of top management's task environment and suggested a causal relationship in which this task environment affected managerial autonomy. The empirical studies (Burns & Stalker, 1961; Duncan, 1972a, 1972b; Lawrence & Lorsch, 1967; Neghandi & Reimann, 1973) yielded imperatives for organizational administration and structure, given certain environmental conditions.

The conceptual works (Emery & Trist, 1965; Terreberry, 1968) indicated that organizations must adapt to external forces in order to maintain viability. The technology-based works of Woodward (1965) and Perrow (1967) extended the contingency idea to include a technological determinism, and Galbraith (1973) bridged environment and technology by focusing on the environmental information-processing needs of the organization. Osborn and Hunt (1976) in their field study found that the interactions of external and internal variables were better predictors of performance than either acting alone.

In identifying the components of the task environment, Dill (1958) proposed four factors: 1) customers, 2) suppliers of materials, labor, capital, equipment, and work force, 3) competitors for both market and resources, and 4) regulatory groups, including

governmental agencies, unions and inter-firm associations. Jauch and Osborn (1981) classified the components of environment as general and specific environments. Chandler (1962) investigated the influence of changing environment on the strategic choice of an organization, and studied such external environmental factors as population, national income, and technological innovation. Since Chandler, research started to shift to determining the relevant external environment and the effects it had on the life and development of the organization. Andrews (1971) identified six elements of environment: technology, ecology, economies, industry, society, and politics. Uyterhoeven, Ackerman and Rosenblum (1973) put forward four dimensions of environment: the political, social, and economical dimension, the market dimension, the product and technological dimension, and the competitive dimension. Hofer (1975) presented the environmental variables that were strategically significant at different stages at the product life cycle—market and consumer behavior. Hofer and Schendel (1978) further discussed the components of the broad environment as 1) economic, 2) demographic, 3) technological, and 4) sociopolitical/legal.

Understanding Strategic Challenge

Strategic challenges will be studied in an effort to understand both the environmental uncertainty and organizational internal challenge. Having studied the national and industry electronics strategies in five newly industrializing economies (NIES) in Asia that are shaping the new competitive paradigm: Korea, Taiwan, Singapore, Malaysia, and China, including Hong Kong, Boulton (1997) concluded that these countries have

been moving rapidly to ever more sophisticated stages of economic development along a continuum of growth that encompasses three stages (Figure 2).

Source: Boulton (1997)

Figure 2. Three development stages for Asian countries.

Stage 1: Providing Low-Cost Labor

Boulton and Kelly (1999) pointed out that Asian emerging industrializing countries have been attractive to large companies that produce labor-intensive products or services and are searching for lower labor costs. The labor costs of those countries have been radically lower than those of industrialized countries, and their populations have been willing to work diligently for long hours. Most of the countries covered in Boulton's (1999) study are already past the low-cost, unskilled-labor stage of development. China is still solidly in this phase, though moving into the technology development phase.

The authors further analyzed that low-cost labor provides only a temporary incentive to cost-driven companies. As local living standards and labor costs have risen, Asian NIEs have lost competitiveness in low-wage job markets and have been forced to move beyond this growth phase in order to maintain their development momentum. China's success in attracting low-wage jobs has added impetus to its neighbors' searches for new ways to attract capital and add value to their products and services. One interesting way that Asian NIEs have met the challenge of rising domestic wages is to act as jobs brokers between multinational companies and lower-wage providers in countries

such as China, the Philippines, or Indonesia. Hong Kong, Taiwan, and Singapore have all used variations of this tactic.

Stage 2: Upgrading Technology and Infrastructure

As Asian NIEs have lost their low-cost labor advantage, they have focused on building up national technology bases with increasingly sophisticated industrial and domestic research infrastructures and incentives designed to attract global technological leaders and advanced research activities. Singapore has been an energetic example of this phase. Its 1991-96 five-year plan budgeted over 3 billion USD to upgrade its infrastructure from that of a manufacturing center into that of an innovation hub capable of creating new and better products and services for the region and the world; included was $500 million to promote innovation within companies by covering up to 70 percent of qualifying project costs. A second thrust developed specialized skills and capabilities, land requirements, and infrastructures to attract international investors. A third thrust was labor skills training for emerging industries and wafer fabrication projects.

This move to upgrade infrastructures is only the beginning of an on-going process of reorienting traditional economies toward technology, innovativeness, and institutional dynamism. Continuing to improve local standards of living and build long-term economic viability requires sustained technological and business expansion.

Stage 3: Developing Globally Competitive Businesses

With today's rapid speed of technological change, Asian NIEs have recognized that they must not only develop a world-class technological base, but also grow world-class

industries of their own. Asian companies are working hard to participate fully in the global marketplace, often using regional markets as springboards. The imperative to do so is part economics, to meet the high costs of keeping up with changing technologies and market demands, and part politics and nationalistic aspiration. In the post-World War II and Cold War eras, Japan and Korea benefited greatly from U.S. technology transfers and support while systematically building their own technological leaders. Today, well-known Japanese competitors include Sony, Matsushita, Toshiba, Hitachi, Mitsubishi, Toyota, Honda, and Nissan. Korea's globally competitive firms include Samsung, Hyundai, Daewoo, and LG. Taiwan, Singapore, Malaysia, and most recently, China, are working to build their own world-class competitors.

Asian governments play a major role in nurturing the growth of such competitors. For example, Taiwan's government has established programs that fund the life cycle of technology development through commercialization, providing funds for basic research and 'ramp-up' to full production and loans for large-scale commercial expansion. Once companies (and countries) build this kind of intellectual property, they are also able to negotiate cross-licenses with global technology leaders and form international scientific and technical exchanges, which help to ensure timely product updates and global competitiveness.

Government-industry relationships tend to change during this third phase of development. For example, as local companies become sophisticated enough to develop and commercialize proprietary products, they tend to eschew public involvement in research projects. Also, companies base future corporate growth and competitiveness on

global market penetration, not on national loyalties. Korean *chaebols* and Japanese *keiretsu* are struggling with this dilemma today. On the international front, global competitiveness can mean that national leaders must consider not only the domestic economy but also other economies in the region and across the globe.

In analyzing strategic challenges, Hoskisson, Eden, Lau, and Wright (2000) suggested that in the early stages of market emergence, institutional theory is preeminent in helping to explain challenges on enterprise strategies. This is because government and societal influences are stronger in the emerging economies such as that in China than in developed economies. They also pointed out that as markets mature, transaction cost economics and, subsequently, the resource-based view are more important.

Historically, power relations and bureaucratic controls ruled planned economies. The state curbed opportunism and allocated resources so there was little need for formal laws to define exchange relationships among economic actors. Property rights were held and protected by the state; individuals could use assets but did not own them. State-owned enterprises were closely tied to governments, receiving direct financial subsidies and indirect preferential treatment. Paternalism, soft budget constraints, and vertical bargaining between the governments and the SOEs characterized central planning (Kornai, 1986).

Strategic Challenges through Institutional Lens.

Institutional theory emphasizes the influences of the systems surrounding organizations that shape social and organizational behavior (Scott, 1995). Institutional forces affect

organizations' processes and decision-making. Perspectives derived to examine these institutional forces have both an economic orientation (Clague, 1997; Coase, 1998; North, 1990) and a sociological orientation (DiMaggio & Powell, 1983; Scott, 1995)

New institutional perspective focuses on the interaction of institutions and firms resulting from market imperfections (Harriss, Hunter, & Lewis, 1995). North (1990) argued that institutions provide the rules of the game that structure human interactions in societies and that the organizations are the players bounded by those formal and informal rules. The role of institutions in an economy is to reduce both transaction and information costs through reducing uncertainty and establishing a stable structure that facilitates interactions.

From a sociological orientation, Palmer, Jennings, and Zhou (1993) studied the institutional constraints on U.S. corporations' strategies in developed market economies. Peng and Heath (1996) argued that the internal growth of firms in transition economies is limited by institutional constraints; as a result, a network-based growth strategy was expected to be more viable in emerging economies. Peng (1997) analyzed three large enterprises in China and confirmed this explanation. In addition, Child and Lu (1996) argued that the economic reform of large state-owned enterprises was moving very slowly because of material, relational, and cultural constraints. Similarly, Suhomlinova (1999) found that government institutions and their influences had a negative impact on Russian enterprise reform. At the individual level, Lau (1998) suggested that political and market pressures were the institutional constraints faced by chief executives in Chinese enterprises. It was noted that chief executives of state owned enterprises had to

be careful not to be too successful, for fear that bureaucrats would replace them to gain access to their resources. Thus, many emerging economy firms facing change were influenced by existing institutional realities.

Institutions can also facilitate strategy, allowing enterprises to react to and play a more active role if they have an adaptive ability that allows them to move beyond institutional constraints (Oliver, 1991). Jefferson and Rawski (1995) discussed industrial reform in China and attributed its success to market institutional change, gradual relaxation of state ownership and control, and development of private property rights. Institutional change provided proper incentives and changes in corporate culture that enabled firms, even state-owned ones, to make improvements. Additionally, Lee and Miller (1996) found that in Korea, a relatively developed economy, firms benefited from a number of cultural and institutional factors. For example, firms employing traditional technologies were more successful in obtaining government help by following legitimate technological norms. In the Czech Republic, Soulsby and Clark (1996) showed how fundamental institutional changes have led to a reinstitutionalization of management in terms of the acquisition of managerial knowledge more appropriate to the new environment, with consequences for strategic decision-making.

Challenges through Resource-Based Lens

The central questions addressed by the resource-based view concern why firms differ and how they achieve and sustain competitive advantage. Penrose (1959) argued that heterogeneous capabilities give each firm its unique character and are the essence of

competitive advantage. Wemerfelt (1984) suggested that evaluating firms in terms of their resources could lead to insights different from the traditional industrial/organization perspective (Porter, 1980). Barney (1986) suggested that strategic resource factors differ in their "tradability" and that these factors can be specifically identified and their monetary value determined via a "strategic factor market." Barney (1991) later established four criteria to more fully explicate the idea of strategic tradability. He suggested that firm resources and capabilities could be differentiated on the basis of value, rareness, illimitability, and substitutability.

Resources are based in a context and, depending on characteristics of that context, a focus on resources could create strategic inflexibility and core rigidities for a firm that would lead to negative returns (Leonard-Barton, 1992). Oliver (1997) analyzed the issue of a firm's sustainable advantage in terms of resource-based and institutional factors and suggested that firms are able to create or develop institutional capital to enhance optimal use of resources. Firms therefore have to manage the social context of their resources and capabilities in order to generate rents. This idea is also underscored by the work of Miller and Shamsie (1996), who found that the Hollywood film industry provided a context that changed over time and created different strategic assets as changes were made.

To this point, little research using a resource-based-view framework has examined strategy differences in the social context of emerging economies. Like most resources that create competitive advantage, resources for competitive advantage in emerging economies are, on the whole, intangible. However, they are not necessarily

product-market-based, as would be suggested by the knowledge-based view of the firm (Conner & Prahalad, 1996). Although some capabilities are standard across all economies, for instance, first mover advantages, others are especially prominent in emerging economies. Multinational enterprises (MNES) often focus on the revenue-generating potential of emerging economies. Accordingly, MNES have focused on the marketing challenge of creating and capturing the huge latent value associated with big remerging economies such as China, India, and Russia. Firms that are able to manage the daunting circumstances in emerging economies reap the benefits of first mover advantages; these include being the first participants in new product markets, reputation effects, and the economic advantages of sales volume and of preemptive domination of distribution and communication channels.

In emerging economies, however, such advantages are difficult to establish without good relationships with home governments. Early relationships give tangible benefits, such as access to licenses, whose number is often limited by a government. Diversified business groups have evolved in many emerging economies. Such groups often obtain licensing advantages because of their government relationships. As institutions change, business groups, which have dominated emerging economies, will have less and less advantage relative to competitors, both domestic and foreign, that wish to enter and exit a market. Khanna and Palepu (1999) suggested that business groups needed to take particular care in restructuring once institutional changes take place that reduce the frictions and asymmetries mentioned above. More freedom and decentralization for business units need to be initiated. More flexibility for setting pay

scales for executives may be one way of allowing for practices that retain the best managers.

In emerging economies, local competitors may have developed capabilities for relationship-based management in their environment that substitute for the lack of institutional infrastructure. These assets may be used domestically or in transferring abroad to other emerging economies where such assets would likewise be useful. Developing distribution mechanisms may protect a domestic firm in an emerging economy against entry by foreign firms. Furthermore, focusing on a market that has not yet globalized might allow a domestic firm in an emerging economy to dodge the onslaught of multinational rivals. Additionally, competing in a global market may be possible in a commodity area where natural resources or labor give a low-cost advantage (Aulakh, Kotabe, & Teegen, 2000). In essence, a firm must understand the relationship between its company assets and the changing nature of the institutional infrastructure as well as the characteristics of its industry. In so doing, the emerging economy firm may be able to become an aggressive contender domestically or globally by using its resources as sources of competitive advantage (Dewar & Frost, 1999).

Strategic Response

There are only a few theoretical and empirical studies using an institutional perspective in emerging industrializing countries, even though some theorists have argued that this perspective is the most applicable paradigm for explaining enterprise behavior in emerging economies (Shenkar & von Glinow, 1994). Emerging economies, characterized by trends towards "marketization" and privatization but still heavily

controlled by the government, provide the necessary institutional influences in developing and testing theories. Previous research points to the importance of studying the speed and nature of institutional change and its impact upon enterprise strategies. Institutional factors also have many dimensions, each of which can change at a different rate. As Tolbert and Zucker (1996) pointed out, the process of institutionalization should be of interest in future theoretical and empirical work. The emerging economies are undergoing changes that will facilitate the study of institutional processes. This observation suggests that researchers should employ longitudinal designs to capture the process elements of institutional effects and compare the strategic responses in economies at different stages of this process.

Oliver (1991) argued that firms could change their institutional environments by developing strategic responses instead of adapting passively. Thus, studies related to how firms develop growth-oriented responses from an active strategic choice perspective, instead of just constrained strategic choices (cf. Bluedorn, Johnson, Cartwright, & Barringer, 1994), would be more relevant. Such a research perspective would extend the ideas of a firm's sustainable competitive advantages (Hennart, 1994; Oliver, 1997) to an emerging economy context. From the institutional economics perspective, how firms restructure themselves in response to institutional change could be a focus in strategy research. This focus would also involve the study of multinational firms' investment decisions in emerging economies under different institutional contexts. Examining the role and effects of institutions in reducing the transaction costs of production and market exchange is also a promising research stream. This point

emphasizes the need to examine interactions between institutional theory and other theoretic approaches.

The current study of institutional effects on emerging economy firms has focused mostly on state-owned enterprises (Child & Lu, 1996; Peng, 1997; Suhomlinova, 1999). Obviously, government institutions directly affect SOEs. On the other hand, the institutional environment including cultural, political, and other factors has also great impact on these enterprises (Sullivan, 1998; Temple & Voth, 1998). The need to explain the process and outcomes of institutional influences in SOE firms is important in understanding the dynamics for consequent responses from these firms for their survival.

Lastly, the effects of the larger institutional context on individual responses rather than on whole firms (e.g., Calori, Johnson, & Sarnin, 1992; Rajagopalan, Rasheed, & Datta, 1993) have not been thoroughly studied. A focus on individual responses to institutional form might cause confusion in studies that cross multiple levels of analysis (ranging from societal to individual), but a more comprehensive examination of the corporate-level effects on managerial responses will enhance understanding of the total institutional effects on individual managerial behavior, as well as top management team orientations.

Transaction cost economics suggested several insights for enterprise strategic responses in emerging economies. The changing environment creates a need and an opportunity for enterprises to change their scopes and their governance structures. However, this process may not be straightforward. First, in emerging economies,

frequent and large macroeconomic and political instabilities and shocks increase exogenous uncertainty. Formal rules may change overnight because of political and judicial decisions. As a result, many firms may defer investments where external shocks are frequent and cannot be foreseen, or where entry would imply high-cost, irreversible investments. Firms may also defer entry if the creation of asset-specific investments, under conditions of external or internal uncertainty, suggests a high probability of opportunistic behavior by an emerging economy government.

Second, institutional infrastructures to support a market-based system are still weak or missing, particularly in transition economies. Opportunistic behavior is likely because of the prohibitively high costs of obtaining information for monitoring, difficulties in constructing legal contracts, and shifts in relative bargaining power due to exogenous shocks. Transaction costs are likely to be higher in emerging economies than in developed market economies, suggesting a preference for more hierarchical governance structures. Further research, therefore, might usefully be directed at analyzing the changing links between governance structures and infrastructure conditions, and at the impact of the continuing role of governments in enterprise governance. In addition, given the importance attached to networks in emerging economies, further research is needed that examines the conditions under which networks are the most effective, comparing vertical and horizontal alliance networks and related forms of diversification.

From an agency perspective, in transition economies enterprises generally lack managerial skills and knowledge of market-based management. As a result, enterprises

are likely to interpret the same objective environment differently, process information differently, and therefore make different strategic responses. This variation suggests scope for comparative studies of the impacts on strategy of governance systems that differ between different types of emerging economies.

Like institutional factors, the ownership and internal governance structures of enterprises in emerging economies might be expected to change over time. The pace of this change may vary according to a number of factors, including the robustness of property rights and the role of insiders in privatization. Evidence from the former Soviet Union, for example (Estrin & Wright, 1999) shows that the shift away from unconstrained insider ownership is very slow. There is a need to understand the implications of the timing of these changes for the development of different strategic options.

Emerging economies provide a social context for examining how institutional changes provide opportunities for probing how competitive advantage changes. At the beginning of the transition period, resources that are valuable in a market context are likely to be scarce, yet the available resources are not necessarily inimitable. Managerial expertise derived from previous experience under a central-planned system seems unlikely to provide resources in an emerging economy environment (Lyles & Baird, 1994), and financial resources are also generally scarce (Filatotchev, Hoskisson, Buck, & Wright, 1996). As competitive markets develop, the acquisition of resources becomes more important.

Many competitive advantages in emerging economies are based on network relationships and close business-government ties, with firms becoming effective monopolies in their home markets. As the institutional context changes, there are necessary changes in both firms' asset structures and orientations. New resources must meet opportunities as well as challenges. For instance, business groups in the past have had advantages based on asymmetries in foreign direct investment. They must now change and evolve toward a business model that does not rely on government lobbying or generic financial investment strategies (Galvez & Tybout, 1985). Product markets must also evolve as more dynamic competition develops. Examining dynamic capabilities, such as the ability to learn continuously (Lei, Hitt, & Bettis, 1996), and the knowledge-based view of the firm (Conner & Prahalad, 1996) will become more prominent in the study of emerging economies. Further research is, therefore, needed on how firms adapt and learn as markets emerge.

The barriers to the acquisition of these resources require examination. For example, entrenchment behavior by incumbents (Filatotchev et al., 1999) may contribute to the maintenance of core rigidities. Similarly, the downside of networks is that the parties involved may collude to resist change unless there is strong competitive pressure and enforcement of the legal infrastructure. Analysis of these barriers to resource development together with the appropriate timing and sequencing of resource development would yield important insights concerning the interaction between institutional and resource-based-view factors.

Strategic Responses and Environmental Challenges

The alignment of an organization's strategic orientation with its environment is of paramount importance for the business's success. The information processing argument (Galbraith & Schendel, 1983) and the population ecology theory (Aldrich, McKelvey, & Ulrich, 1984) suggest that an organization's information processing system (in the form of hierarchical relationships and standard operating procedures) must be capable of accommodating both the variability and the uncertainty of its product-market environment. In the Chinese economy, the necessity for a strategy-environment fit can be greater because managerial discretion is highly constrained, strategic restructuring is fairly costly, and the industrial environment is enormously complex and turbulent (Child, 1994; Shenkar & Von Glinow, 1994).

The industrial environment in China is dynamic and complex (Luo, 1995); its influence is thus highly sustainable (Tung, 1982). As a result of structural transformation, most industries have been substantially decentralized or even privatized (Perkins, 1994). Efforts to revitalize and restructure Chinese industry are closely linked to the reform of pricing, public finance, ownership, and social welfare. Thus, the industrial environment has a critical impact on firm operations. Reform has meant an expansion not only of markets but also of industrial competition (Jefferson & Rawski, 1993). Naughton (1992) observes sharp reductions in the dispersion of profitability across Chinese industrial sectors. There is also evidence of convergence in financial returns to capital, labor, and materials across ownership types (Jefferson et al., 1992). These tendencies should be attributed to the decline and convergence of profit rates due

to the continuing erosion of barriers that formerly protected state firms. Byrd (1992) finds that recent concentration ratios (market share of a few leading companies) for Chinese industry tend to fall considerably below comparable figures for the United States and Japan. These ratios even show a declining time trend (Su, 1993). Consequently, SOEs are now facing tremendous competitive pressure, not only from township and village enterprises (TVEs) and privately owned enterprises, but also from foreign investors.

The strategic choice perspective suggests that a firm needs to have different strategic responses to adapt to different kinds of industrial competition (Miles & Snow, 1978). Organizational adaptability involves a firm's innovativeness, proactiveness, and riskiness (Miller & Friesen, 1983). These responses affect the firm's orientation in scanning, identifying, and capitalizing on emerging market opportunities, and its extensive capabilities to respond to market and contextual changes (Hambrick, 1983). As a hybrid strategic response between proactiveness and defensiveness, analysis strategy focuses both risk-adjusted efficiency and emerging market opportunities (Miles & Snow, 1978). Firms using this strategy defend existing product markets through efficiency-oriented strategies while cautiously penetrating new markets through intensified product/market innovation. Tan and Latchet (1994) find that Chinese managers' perception of industrial competition intensity significantly influences their firms' decision characteristics, including propensity for risk taking, innovativeness, proactiveness, and analysis.

Holistic Strategic Response Model – the Conceptual Framework

The conceptual framework (Figure 3) is a strategic challenge & response model derived from Hofer's (1973) preliminary research on patterns of strategic behavior. This framework is built on the concept of business strategy and designed to provide an analytic tool for examining and studying the strategic challenges and responses. The research questions are intended to collect specific information about firm's challenge-response behavior:

1. What factors create strategic challenges to the company?
2. How has the company responded to a more market driven environment?
3. What factors determine the strategies of the company?
4. What new business processes and structures have been planned and implemented?
5. How do you measure performance of the new strategies?

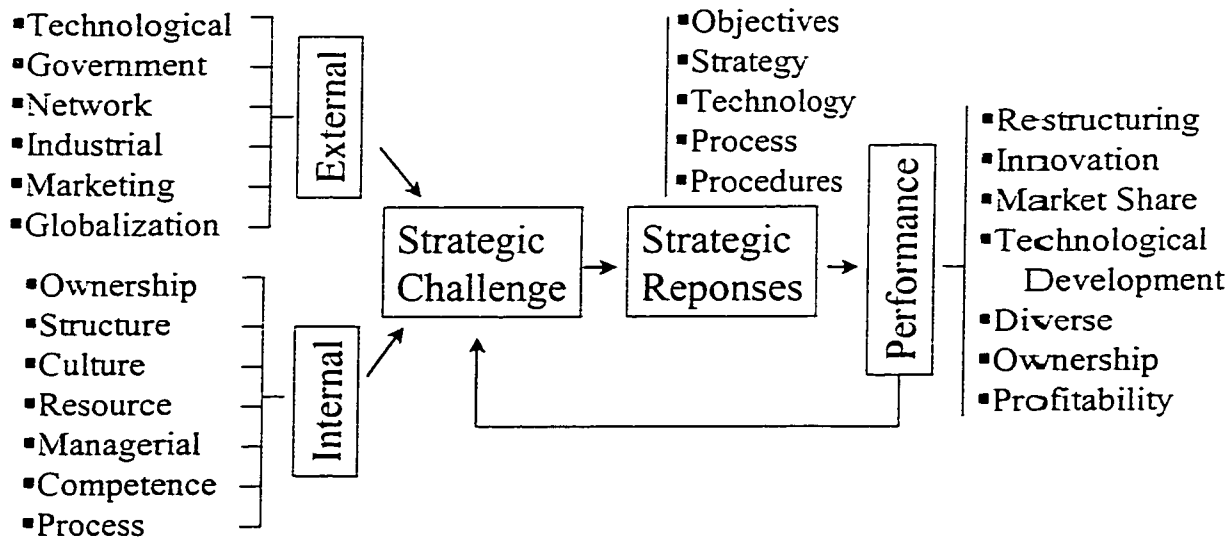


Figure 3. Conceptual Strategic Challenge-Response Model

In essence, the assumption of this model is that the alterations in a firm's strategy set (objectives, strategy, functional policies and procedures) are the results of response to either actual or predicted changes in its external environment and/or internal situation. The type of strategic response adopted for a specific strategic challenge would significantly influence the future success or failure of the firm (Hofer, 1973).

CHAPTER III: RESEARCH DESIGN AND METHODOLOGY

Research in Emerging Economies

Hoskisson, Eden, Lau and Wright (2000) noticed that the strategy literature was just beginning to come to grips with the implications for state-owned enterprises of the economic and political changes that have occurred over the past 10-15 years. Data and methodological issues have been haunting strategy researchers in rapid-growth developing and transition economies, which are the culprits causing a paucity of research in this field.

The problems challenging research on strategies in emerging market economies include (1) that theories promulgated for developed market economies may not be appropriate for emerging economies, (2) that researchers are troubled by sampling and data collection problems, difficulties in measuring firm performance, and a variety of timing issues; and (3) that emerging economies are not a homogeneous or clearly identifiable and recognizable group. What's more, it is likely that different segments of emerging economies find themselves in different states of development: some still depending on low-cost labor, others becoming technology-based, and some leading edge firms moving into global markets. It is expected that the challenges and responses will differ between firms, depending upon the nature of their own competitive environment.

Organizational Transformations

Since China's prior economy was based on a stiff central planned system, there are almost no well-tested and developed theories for strategic management under such conditions. Now that China is making a transition towards a more open, market driven economy, there is a great need for researchers to understand the institutional problems in making this move. Research hypotheses and research instruments developed and used in developed markets may not be applicable in this context because the research designs have not considered essential conceptual and cultural differences between developed market economies and emerging controlled or planned economies.

At the same time, Phelan (1997) pointed out that the push for more rigor in strategic management research has lead to a decline in relevance as researchers search for data that is reliable, easy to obtain both in terms of time and money, and easily quantifiable. Research has become data-driven rather than theory-driven. It is the availability of data that determines the questions asked, rather than the study of important questions. McKelvey (1997) asserted that quantitative studies in today's dynamic world are sterile and simplistic because of the inability to capture change, complexity and uniqueness. Even researchers who work with these large-scale public databases recognize that the scarcity and inadequacy of available data represents a serious problem (McGahan & Porter, 1997).

Sampling and Data Collection

Mintzberg (1979) noted: " No matter how small our sample or what our interest, we have always tried to go into organizations with a well-defined focus – to collect specific kinds

of data systematically." In China there are special problems to be addressed in conducting such research.

The absence of a culture involving independent researchers may make it difficult to establish trust between respondent and researcher. Under a controlled economy, SOE managers were highly bureaucratic and political. They did not need to provide information to outsiders, and were able to operate behind a wall of secrecy. Thus, Lee and Miller (1999) highly recommended the research method in collaborative projects with local researchers using face-to-face interviews, which can be a key means of gaining access to reliable data sources. Luo and Peng (1999), and Luo, Tan, and Shenkar (1998) reported response rates of around 25 percent from mail surveys. Inefficient postal systems are another source causing low response rate from mail survey subjects.

Great care was taken in assessing the accuracy of data available on-line or through public resources because the data sources are rapidly outdated owing to the fast pace of economic growth and frequent policy changes. Firm data, for instance, collected at the state, province, and city levels, as well as by different government departments in China, are sometimes not consistent with each other (Hoskisson, Eden, Lau and Wright, 2000). The use of multiple informants and data sources is an important means of obtaining reliable and valid data. In this study, data triangulation (Patton, 1987) technique was used so that information collected from the firm documents and archival records, public data source such as newspaper publications, government records, and interviews from senior managers could be compared for data reliability validity. As Yin (1994) explained that triangulation serves to corroborate the same fact or phenomenon

through gathering information from multiple sources. He concluded that triangulation helps solve the potential problems of construct validity.

Another problem in conducting research in strategic management was gaining access to senior management. Usually firm upper-level managers are very reluctant to get involved with researchers, especially without the consent of the CEO because CEOs in many emerging economies monopolize information flows. Very often, the information obtained from managers under such circumstances is normative answers, i.e. the ideal conditions they are expecting for, rather than the true facts in the firm (Adler, Campbell & Laurent, 1988). In order to conquer this problem, help from people in high social position were sought, and this social network greatly facilitated the access to CEOs in the firms of focal research. Some of the CEOs commented that they were doing a favor for the introducer when these CEOs agreed to talk with the researcher.

As Hoskisson, Eden, Lau and Wright (2000) indicated that understanding and knowledge of terms and concepts familiar to managers in developed market economies may create problems in data collection and reliability of responses in emerging economies. Misunderstanding often occurs in respondents because of cultural equivalency issues that are usually addressed through back-translation (Riordan & Vandenberg, 1994). Addressing issues relating to whether language terms are understood may place a premium on providing respondents with thorough explanations of terms, and on using a methodology that provides researchers with the ability to check and probe aspects of behavior, notably face-to-face interviews. In this study, the interview questions were first reviewed and revised by experts in strategic management and then

subjected to a translation and back-translation procedure to ensure validity in a cross-cultural setting (Adler, Brahm, & Graham, 1992).

Performance Measurement

The measurement of the performance impact of strategies was particularly problematic in emerging economies. First, financial reporting in Chinese firms was based on conventional developed international market standards. Second, even where relevant financial reporting legislation had been enacted, its enforcement may be problematic. Comparisons of financial performance over time made it difficult to link data compiled under different regimes and systems. This problem was compounded by substantial inflation and devaluation of local currencies. In addition, widespread use of barter in economies with underdeveloped financial systems meant that published sales and profit data do not provide reliable measures of activity. For this reason, the major measures for firm performance were firm strategic restructuring for market competition, technological development and innovation, firm diverse ownership as well as market share and profitability.

Case Research Data Selection

Two fundamental questions exist at the core of strategy research (Bowman, 1995): 'What makes some firms more successful than others?' and 'How do I make this particular firm successful?' Famous researchers, such as Chandler, Andrews, Mintzberg and others, relied on case studies and company histories to generate a wealth of theories and insights

into corporate practice (Allison, 1971, Bower, 1970; Chandler, 1962; Cyert & March, 1963; Mintzberg, 1979; Raisinghani, & Theoret, 1976).

Eisenhardt (1989) provided a road map to developing theories from case studies that may be appropriate in an emerging market context. An integral part of this approach is the development of research instruments that can be used in quantitative studies. In addition, the combination of quantitative and qualitative data in emerging market research can be particularly useful in yielding novel, relevant, and reliable insights. The scarcity and inadequacy of data sources in strategic management has been identified as an important problem confronting researchers in the discipline. In this research, the criteria for selecting firms are (a) firms that participate in national projects and (b) firms that are recommended by experts in this field, such as Professor Wu, who is the Chief Scientist for National High-Tech Program for Automation Technology, Director of National CIMS Engineering Research Center, and Member of Chinese Academy if Engineering. Professor Wu has completed numerous projects with Chinese SOEs, and provided introduction to CEOs.

Open-ended case study interviews were employed when talking to CEOs, in which key respondents could be asked for facts of a matter as well as for the respondents' opinions about events. CEOs' insights into some occurrences helped to form propositions as the basis for modifying further inquiry and research. The best way of collecting data from CEOs is to let the interviewee speak their mind. Interruptions or questions in the middle of the interview often stop their train of thought, and spoils the

whole logic of thinking. Therefore, unless necessary, the interviewer should be very patient and jot down questions for later inquiry after the executives finish their oration.

Semi-structured interviews were conducted with officials at six representative SOEs across six industries regarding how they successfully initiated strategic change, how they achieved their goals in terms of developing competitive product development, and how they had to change their policies and procedures to achieve the fit among the structure, strategy and culture. People designated in the interview were managers from departments of technology, HR, production, marketing and planning. These people had first hand experience for what was going on and what has been done.

Case Study Method

Individually, each firm was written up as a research case study, and collectively, a model of strategic transformation of Chinese firms was developed. The cases all began with a strategic overview or the firm and its business activities, and then specifically address the research questions in this dissertation:

1. What factors create strategic challenges to the company?
2. How has the company responded to a more market driven environment?
3. What factors determine the strategies of the company?
4. What new business processes and structures have been planned and implemented?
5. How does the firm measure performance of the new strategies?

From this data, conclusions were drawn about how these companies were changing their strategies, structure, policies and procedures to deal with changes in the industry and competition pressure from international arena or when China joins the

WTO. Lessons from these companies will be relevant to other SOEs facing similar forces of change and challenge. The results are intended to be helpful to managers, researches and policy makers.

Tape recorders were used after getting the permission from the interviewees so that the researcher could concentrate in probing and interacting with the subjects. After the interview, transcripts were written out from the tapes of interviews for result analysis.

Detailed analysis for the first case was reviewed before the second case study started so as to make sure that the research was on the right track, and improvements were made for further studies, since the researcher was on the half of the planet, and it was hard to make any remedy for the data once the researcher came back to the states.

Research Questions

The first dissertation question probed the factors creating strategic challenges to the focal firms. Based on the literature review, six categories of strategic challenges, which were consistent with the findings of researchers studying emerging economies (e.g. Child & Lu, 1996; Hoskisson, Eden, Lau & Wright, 2000; Kornai, 1986; Lee & Miller, 1996; Peng & Heath, 1996; Soulsby & Clark, 1996), including (a) market, (b) industry, (c) technology, (d) institution such as government regulation and infrastructure, (e) resource and capability, and (f) broader environment.

In the interview with managers, research of the market related challenges focused on major challenges in market structure, market share, market expansion, product life

cycle and customer satisfaction. Industry related challenges concentrated on the following:

1. Competitor related challenges: major changes in the market share of existing competitors;
2. Supplier related challenges: major changes in availability of raw materials. and conditions of trade;
3. Customer related challenges: major changes in demographic structure and types of customers and customer preference;
4. Product and process technology related challenges: major changes in speed of learning technology, product design capability, and technology development capability.
5. Driving forces and key success factors

In assessing resource and capability related challenges, questions were asked about major changes in capital or cash flow, excesses or shortages in production facilities, inadequacy or loss of management talents and ability to acquire needed information. Investigation of macro-environmental challenges will center on changes in economic condition, political/legal constraints, and social /cultural values.

The second research question asks what factors determined the strategies of the company. Among the identified challenges to the focal firm, which impacted the strategy formulation process. The strategy model provides three representative group of variables to be considered: (1) environment, (2) resource and skills, and (3) values and aspirations of top management (Han, 1988).

The third research question studies how has the company responded to a more market driven environment. In other words, what approaches has the firm taken in response to the environmental change or what new business processes have been planned and implemented. What are the technologies required for staying competitive within the market? What are the technological investments required to remain ahead of the competition and serve customers? How has the company improved the technologies? Did the firm change the ownership structure? Did the firm use an acquisition strategy or diversification strategy to meet the market needs? Or did the firm just wait and rely on the government for solution?

The fourth research question explores the relationship between the firm's response strategies and its performance. What criteria has the firm used to measure performance of the new strategies: market share or profitability (such as ROI, ROE, or ROA), time require to breakeven, sales level, sales growth, ability to control costs, ability to earn foreign exchange? How were the performance indices evaluated?

The last question aims at collecting information concerning the impacts of changes on the organization and its culture. What do you believe and how you will act (values)? What will you accomplish long term (Goals)?

From what have been discussed, a detailed list has been developed both for open-ended questions and semi-structured interviews.

Open-ended Questions

- Can you please identify the major challenges for your industry and are these factors equally challenging to your firm?

- Which factors are most threatening in terms of firm survival:(a) market, (b) industry, (c) technology, (d) institution such as government regulation and infrastructure, (e) resource and capability, and (f) broader environment?

Semi-structured Questions

Question One: What factors create strategic challenges to the company?

(1) For managers in marketing:

- Please rank the following according to their strategic significance to your firm: market structure, market share, market expansion, product life cycle and customer satisfaction.
- What competitor related challenges do you see as more relevant to your firm's market share position?
- After joining WTO, do you expect major changes in demographic structure and types of customers and customer preference?
- In the next two to three years, do you think that the threat of competition in your business will increase?
- How strong was the competitive position of your company at the global market?

(2) For managers in technology and production:

- Is technology a major concern in global competition for your firm?
- What are the product and process technology related challenges: major changes in speed of learning technology, product design capability, and technology development capability or else?

- What are the technologies required for staying competitive within the market?
- What are the driving forces and key success factors in technological innovation?
- What are the technological investments required to remain ahead of the competition and serve customers?
- How has the company improved the technologies?
- Do you have excesses or shortages in production facilities to meet the market demand?
- What have you done with your product quality?

(3) For resource and capability related challenges:

- What are the major changes in capital or cash flow?
- Where and how do you acquire working capital for your operation?
- Do you have enough management talents for your successful operations?
- Do you have the ability and network to acquire needed information?
- What are the major changes in economic condition in the transformation today?
- What political and legal constraints your firm is facing?

Question Two: How has the company responded to a more market driven environment?

- What approaches has the firm taken in response to the environmental change or what new business processes have been planned and implemented?
- Did the firm change the ownership structure to make adjustment to the performance efficiency and competition?

- Did the firm use an acquisition strategy or diversification strategy to meet the market needs?
- Did the firm just wait and rely on the government for a solution?
- What policies and procedures have you taken to deal with (1) environment, (2) resource and skills, and (3) values and aspirations of top management?

Question Three: What factors determine the strategies of the company?

- What factors determined the strategies of the company?
- Among the identified challenges to the focal firm, which ones have the greatest impact on the strategy formulation process?

Question Four: What new business processes and structures have been planned and implemented?

- What are the functions of the new process: costing down the cost, shortening the production time, improving quality?
- Have you flattened your chain of command or added up more layers to facilitate organizational communication?
- What does the organizational structure look like now?
- In what ways is the new structure more effective compared with the previous one?

Question Five: How do you measure performance of the new strategies?

- What criteria has the firm used to measure performance of the new strategies: market share or profitability (such as ROI, ROE, or ROA), time required to

breakeven, sales level, sales growth, ability to control costs, ability to earn foreign exchange?

- How and who is going to evaluate the performance results: management team, shareholders, or the government?

The results of these interviews along with other company and public data provide the content for the case studies that follow. Each case discusses the company's background, strategic forces and responses, and performance results that have occurred as the work to transform themselves from SOEs to professionally managed and market driven enterprises. The cases include:

1. China Huajing Electronics Group Corporation ("Huajing") -- a leading microelectronics enterprise in China;
2. Beijing No. 1 Machine Tool Plant, One of China's major machine tool producer;
3. Chongqing CHN & CHN Ceramics Co., Ltd., global market leader in high-end segment of ceramics products;
4. Sichuan Chemical Works (Group), Ltd., one of the biggest Chinese chemical fertilizer manufacturer;
5. Jingwei Textile Machinery Co., Ltd., the biggest textile machine tool producer in China;
6. Harbin Electric Machinery Co., Ltd., the biggest electric motor producer in China, and one of the five leading firms in the world.

Following the challenge-response-performance paradigm, we would logically expect that SOEs would adopt different strategic postures that are consistent with their respective environments in order to achieve a fit, which is crucial to their survival and success. The main purpose of chapters IV to IX is to examine and identify strategic challenges, responses and the consequent successes among firms operating under different environmental constraints.

CHAPTER IV. CHINA HUAJING ELECTRONICS GROUP CORPORATION

China Huajing Electronics Group Corporation ("Huajing") is a leading microelectronics enterprise in China with 4,393 employees and assets worth 3 billion *yuan* RMB[2]. Since its beginning, Huajing has attracted the attention from China's top leaders. President Zemin Jiang, Parliament Head Peng Li and Premier Rongji Zhu have visited Huajing several times. President Jiang encouraged Huajing employees to "work hard to speed up the information process for the national economy".

Huajing specializes in the development, manufacturing, sales and marketing of metal oxide semiconductor (MOS) integrated circuits (ICs), bipolar ICs, and discrete electronic devices. It has three-semiconductor wafer fabrication and assembly lines, a photo mask shop, a tooling and stamping center, a silicon material preparation plant and a utilities supply system. It also has its own research and development (R & D) center with a state-of-the-art pilot line that supports its manufacturing activities. Leading products include (1) high, medium and low power transistors, semiconductor chips and related products for use in household appliances, lighting, communications, and industry automation, (2) bipolar analog ICs for information household appliances, communications, and industry automation, and (3) MOS ICs for household appliances, electronic watches and clocks, communications, toys, and industry automation. While Huajing was addressing the problems of transforming itself from a

[2] 1 USD = 8.25 *yuan* Renminbi (RMB, meaning People's Money), Chinese currency.

state-owned enterprise to a stock-driven modern corporation, President Wang was concerned that limited resource would not be adequate to keep up with the required growing investments.

Industry Competitive Situation Analysis

According to the Ministry of Information Industry (MII), the output value of China's electronics industry was expected to reach $110 billion USD for 2000, growing nearly 25 percent over 1999. IC and electronic component sectors are projected to grow to 3.9 billion units and 250 billion units, respectively, for a growth rate of 50 percent. The total IC market in Mainland China in 2000 would reach $20 billion, a 21 percent jump from the previous year. Consumer electronic products would require 43 percent of the ICs, and information technology (IT) and telecom products 30 and 20 percent, respectively.

China produces less than 1 percent of the world's ICs. About 87 percent of total chips needed in Mainland China were imported (Table 2). Such a large market was attracting leading IC makers to find means to enter the market. The Chinese government added favorable policies to support the development of the microelectronics industry. Such overseas giants as Motorola, Nippon Electric Company (NEC), Philips, Siemens, and Toshiba are transferring technology, building wafer fabs, and forming joint ventures with Chinese partners. Japan is investing more in China's semiconductor industry than any other country. Toshiba has been running an assembly plant near Shanghai since 1994 and Hitachi has packaged Dynamic Random Access Memory (DRAMs) since 1997. Fujitsu also transferred technology to a Chinese company to assemble logic chips.

Table 2. China's IC Import and Export Product Type in 1999

Type	Import Volume (10 thousand)	Import Value (10 thousand US $)	Export Volume (10 thousand)	Export Value (10 thousand US $)
IC chip	4431	6798	1322	2277
MOS Technology Produced IC	52053	34535	1231163	31062
Bi-pole Technology Produce IC	13858	8013	8723	2258
Mix and other Technology Produced IC	285624	163831	56827	13856
Other Single Chip IC	1238718	393099	187667	55445
Mix IC	104676	134288	25619	70257
Microelectronics component	28684	12791	15302	13774
Total	1728046	753355	418576	188929

Source: Xiaotian Xu, Department of Electronics Information Product Management, Ministry of Information Industry, China, Date: 06/21/00

Of China's 330 semiconductor plants, 36 produced ICs and the rest produced discrete devices. Among the 36 IC manufacturers, only a few processed wafers and fabricated ICs; most focused on back-end packaging and test operations. Shanghai and the surrounding area were fast becoming China's most important region for IC design and manufacturing. The most advanced Huahong-NEC Microelectronic joint venture, also known as Project 909, churned out 64 Mbit Synchronous DRAM (SDRAMs) at the 0.35-micron level for export to NEC Japan. NEC plans 0.25-micron production in the near future.

Eventually 20-50 percent of capacity would be sold in the local market. Project 909 raised the bar for others, including Huajing Group in Wuxi, Jiangshu Province;

Shanghai Belling Semiconductor Co. Ltd.; Huayue Group in Shaoxing, Zhejiang Province; and Shanghai Advanced Semiconductor Co. Ltd.

About one-third of China's back-end (packaging and test) capacity was also located in the Shanghai region. Along with local factories, Panasonic, Fujitsu, Alpha Tec and other foreign packaging and test vendors located near Shanghai. Global IC leaders like Intel, AMD, Samsung and Hyundai were also constructing huge back-end lines in and around Shanghai. NEC's participation in Project 909 was a goodwill project enabling NEC to sell more telecom equipment in China. The mainland often required foreign investors to include technology transfers and extensive staff training in approved projects -- and hinted that compliance could lead to huge government contracts. In NEC's case, some 450 Chinese were flown to Japan for five months of training.

The leading IC fabrication companies included Shanghai Hua Hong Group Corp.; Shougang NEC, Beijing; Advanced Semiconductor Manufacturing Corp. (ASMC), Shanghai; Shanghai Belling Microelectronics Manufacturing Co. Ltd.; Hua Jing Electronics Group Co., Wuxi; and Hua Yue Microelectronics Co. Ltd. (Table 2). Together, these chip makers accounted for 80 percent of China's current production capacity. Most of China's major semiconductor facilities were partly or wholly foreign-owned by companies such as NEC, Matsushita, SGS-Thomson, Philips, Northern Telecommunications, Samsung, Motorola, Harris, and Intel. PresentlyChina's state-of-the-art semiconductor technology is 0.35 μm with some still at a level of 2-3 μm, well behind the 0.18 μm or 0.13 μm of the West.

Shanghai Huahong NEC Electronic Co. Ltd featured an 8-inch 0.35μm CMOS fab line, which could produce 20,000 wafers per month. Beijing Shougang-NEC Electronic Co. Ltd featured a 6-inch 0.50μm CMOS fab line, producing 8,000 wafers per month. Recently, Shougang-NEC upgraded its fab line to launch 0.35μm technology. Wuxi CSMC-HJ Co. Ltd also had a 6-inch 0.50μm CMOS fab line. Recently, Motorola's facility in Tianjing pressed ahead with debugging the 0.25μm or 0.18μm CMOS fabrication line. This was the most advanced wafer foundry in China in 2000. Only Shanghai Advanced Semiconductor Manufacturing Corp. (ASMC) possesses a 6-inch 0.8μm CMOS fab line with 6,000 wafers per month (Table 3 and 4 describe the key electronics firms and their technologies).

Table 3. Summary of Chinese IC Fabs

Manufacturers	Technology	Silicon Chip Size (inch)	Produce Capacity (per month)	Remarks
China Huajing Electronics Group Co.	2-5u (bi-pole)	4-5	15000	Including the pre- and post- produce lines
	1.5-3u (CMOS)	5	12000	
	0.8-1u(CMOA)	6	6000	
Huayue Microelectronics Co. Ltd.	2-5u (bi-pole)	4-5	20000	Including the pre- and post- produce lines
Shanghai Belling Stocking Co. Ltd.	1.2-2u (MOS)	4	15000	Including the pre-produce line
Shanghai Pioneer Semiconductor Produce Co. Ltd.	2-3u (bi-pole)	5	12000	Including the pre-produce line
	0.8u (CMOS)	6	6000	
Shougang NEC Electronics Co Ltd.	0.5-3u(CMOS)	6	8000	Including the pre- and post- produce lines
Shanghai Huahong NEC Electronics Co. Ltd.	0.35u(CMOS)	8	20000	Including the pre-produce line
Hangzhou Youwang Electronics Co. Ltd.	2-3u (bi-pole)	4	1800	Including the pre-produce line

Source: Xiaotian Xu, Department of Electronics Information Product Management, Ministry of Information Industry, China, June 21, 2000.

Wafer fabs having technology level above 1μm included Wuxi Huajing Semico Microelectronics Co. Ltd, Shanghai Belling Corp. Ltd, Hangzhou Youwang Electronics Co. Ltd and Shaoxing Huayun Electronics Co. Ltd. Wuxi Huajing was operating a 4-inch and a 5-inch 2μm to 5μm bipolar fab line providing a capacity of 15,000 units per month; Shanghai Belling was operating one 4-inch 1.2μm and one 4-inch 2μm CMOS fab line with monthly capacity of 15,000 wafers. Monthly capacity of 12,000 wafers was provided by Shanghai ASMC equipping a 5-inch 2μm and a 5-inch 3μm bipolar fab line; Hangzhou Youwang equipped one 4-inch 2μm and one 4-inch 3μm bipolar fab line with a monthly capacity of 180,000 wafers; Shaoxing Huawang only featured one 4-inch and one 5-inch 2μm to 5μm bipolar fab line with a monthly capacity of 8,000 wafers.

The partners in Beijing Huaxia Semiconductor Manufacturing Co. Ltd (HSMC) were Shougang Group, a steel and iron maker in China; the Beijing municipal government; Alpha and Omega Semiconductor Inc.; and Joshua Semiconductor Inc. The initial investment totaled $1.34 billion. The partners planned to establish another 8-inch, 0.25μm fab by 2002. Annual sales from the two 0.25μm production lines were expected to total about $600 million. HSMC planned to build as many as six other fabs by 2010 at a total investment of $10 billion. One would be a 6-inch production line with a monthly 30,000-wafer capacity. Other lines would use 8- or 12-inch technology with monthly capacities as high as 300,000 wafers.

Table 4. IC Manufacturing Technology Status in China

Company (location)	Foreign Partner	Chinese Partner	Product Sector	Technology (monthly wafer capacity, in year 2000)
ASMC (Shanghai)	Philips Semi-conductors	Shanghai Belling	Wafer Foundry	5".1.5μm Bipolar (25,000) 6".0.6μm CMOS (15,000)
Shanghai Belling (Shanghai)	Alcatel (Belgium)	Shanghai Hua Hong/ Shanghai Bell Co.	Telecom IC Card Consumer	4", 1.2-2μm MOS 4", 3μm BiCMOS (Total 13,000)
Shougang-NEC (Beijing)	NEC (Japan)	Capital Iron & Steel Co.	4 Mbit DRAM, 64 Mbit DRAM, MCU	6", 0.35μm CMOS 6", 1.2μm MOS (total, 10,000)
Hua Jing (Wuxi)	-	State-owned	Consumer	4", 2-3μm Bipolar (15,000) 5", 2-3μm Bipolar (1,600) 5", 3μm MOS (10,000) 6", 0.6μm CMOS (10,000)
Hua Yue (Shaoxing)	-	Zhejiang Province	Consumer	3", 5μm Bipolar 4", 3-5μm Bipolar 5", 2 μm Bipolar
Shanghai Hua Hong NEC (Shanghai)	NEC (Japan)	Hua Hong Electronics	64 Mbit DRAM Logic IC	8", 0.35μm CMOS (16,000) 8", 0.35μm logic chips (4,000)
CSMC-Hua Jing (Wuxi)	-	CSMC/Hua Jing	Wafer Foundry	5", 0.5μm CMOS (28,000) 6", 0.5μm CMOS (16,000)

Source: IEEE Spectrum, December 1995; D. Greene 1996; and Tsuda 1997; WSC study visit, 4/2000.

HSMC would provide analog ICs, mixed-signal chips and electric-component ICs as well as digital IC and Flash memory. Local design houses would be HSMC's eventual partners as homegrown businesses increasingly master analog and digital semiconductor design. Amplifiers, data converters, interface chips, radio frequency (RF) ICs and sensors would be major product categories under HSMC's plan. Target markets included telecommunications, computers, automotive electronics, and consumer electronics.

Shanghai Grace Semiconductor Manufacturing Co. Ltd planned to build a $1.63 billion facility in the Zhangjiang Hi-tech Park, Pudong New Area in Shanghai. The new facility would have an 8-inch wafer production line with monthly capacity of 50,000 wafers using the 0.25μm process technology. The main products would include large

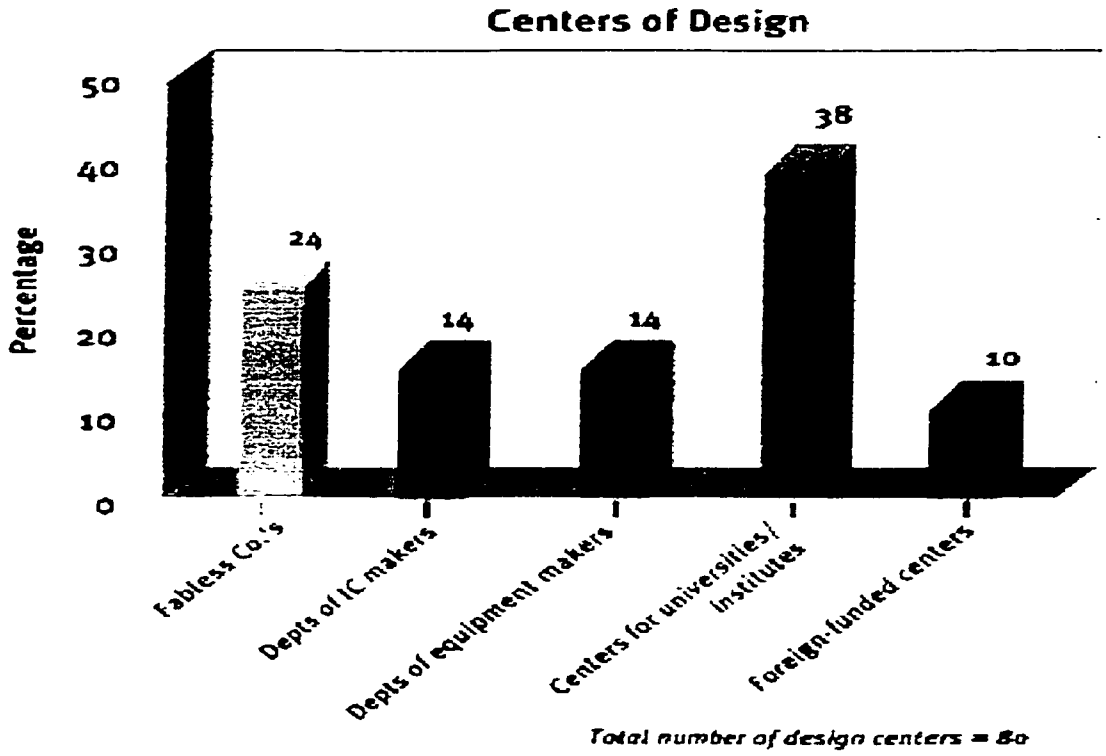
scale integration (LSI chips), including DRAMs, static random access memory (SRAMs), Flash memories, and central processing units (CPUs). The company expected construction and equipment installation to be completed by the end of 2001. Mass production was targeted at the third quarter of 2002. About 20 IC production lines were set to be introduced in the park this decade, amounting to $2 billion to $4 billion in output value.

Leading competitors, like Mosel Vitelic Inc. of Taiwan, was moving from DRAMs to system LSIs over the next five to 10 years. Currently, the company generated 75 percent of its sales from DRAMs. However, the company intended to increase output of system LSIs to reach 75 percent of sales by 2010. Manufacturing system LSIs required 0.1μm technology using 300mm wafers. The company planned to construct two lines for 300mm wafers. One was the ProMOS Fab in Hsinchu, Taiwan, which would initially start producing DRAMs in 2002 using 0.13μm process and would later be upgraded to 0.1μm. The other plant in Canada, by 2003, would manufacture Flash memory chips and Flash memory-embedded logic ICs using a 0.14μm rule. This plant also would downsize the process rule to 0.1μm by the end of 2004.

IC Design

In China, IC design (Figure 4) was regarded as a part of IC manufacturing industry. Now design actually drives the IC industry. "IC design is the key driver in China -- not foundries", said Chang Zhong Yuan, deputy general manager of Shanghai Belling, China's leading foundry. "Any [chip industry] breakthrough will come in design instead

of manufacturing," he says "Manufacturing requires a huge investment that China cannot afford, and some of the domestic foundries have no products and a lot of capacity left over." Design can be defined as a bridge between the market and IC manufacturing. Over 90 percent of China's entire fab capacity is reserved for overseas markets, while ironically the country needs to import 95 percent of ICs it consumes. This is not only due to the poor design capability in the country, but also due to the loose link between



design houses and foundries.

Figure 4. IC Design Centers in 1999

Compared to the manufacturing industry, the formation and development of the IC design industry lags in China. In 1998, there were about 80 design companies in China, but many of them were in universities or research institutes. Most of them had

small investments, around $500,000 USD, and few staff. The total number of IC-design engineers in China was estimated to be 1,500 and sales revenue from IC design would not be more than $25 USD million in 1997. This compared to around 300,000 to 400,000 in the Silicon Valley. In Taiwan, there would be no less than 6,000 IC-design engineers.

IC designers need to master the mature design technologies (for example, those at 0.5μm), before they can move to new ones (0.35μm, 0.25μm, and 0.18μm) with high design complexity. The central government encourages Chinese designers to design their own ICs so that they can replace the large number of imported ones found in these appliances. As a result, most ICs designed by local engineers are consumer ICs... some are communication ICs. Consumer ICs are simple to design. That is why the average price of the China-made IC is less than 10 USD per unit. The country's communication ICs have higher product value. Smartcards offer a great opportunity for investment. The central government can encourage Chinese designers to develop such products with their own IP before foreign companies jump in. That way, Chinese engineers can accumulate precious design experience that is crucial for future development. Moreover, this would be a good source of revenue because China is a huge market.

In the past 15 years, many Chinese students went abroad for higher education. Now, there are about 5,000 Chinese IC designers spread across the world, especially in the United States. This is the time to invite them back to develop the design industry.

Fabless design companies include CIDC, Beijing Huahong, Beijing Zhongxin, Shanghai Huahong, Shengzhen Aike Microelectronics and Shenzhen State Microelectronics. Huahong has designed many products, such as untouchable memory

card, touchable CPU card, watt-hour meter chip, and control chip of handset battery. With government support, CIDC has established itself as a leader in IC design and provides ongoing technical support to 7 regional IC design centers. According to CIDC, non-Chinese customers for design services and/or its Panda 2000 design tools include C-Cubed, S3, Intel, National Semiconductor, Fujitsu, and NEC. CIDC has 180 employees with over 60 percent of its engineers having worked or been trained abroad. Its revenues in 1999 were $6 million; projected revenues in 2000 are $10 million. CIDC is believed to be seeking approval to privatize through a public stock offering. Aike Microelectronics has been able to design a two-port SRAM chip enabling up to 15ns data rate. The IC CAD Federation expects annual sales revenue from IC design to be about 150 million to 200 million USD by 2000.

In recent years, the subsidiary IC design departments in communications manufacturers such as Datang, Huawei and electronic companies like Panda, Langchao and Haier have made some progress in integrated system design. It is said that Huawei is able to design 0.18μm chip. In addition, many university and research institutes have joined the IC design and development initiatives. Tsinghua University, Fudan University, Beijing University and Shanghai Jiaotong University are actively pursuing high-level design and large-scale integration. Moreover, many foreign companies, including those from Taiwan, are establishing chip design centers. Among those are Shanghai Epson, Intel, Nortel Networks, Avant, Beijing Motorola, Analog Devices, NEC and Sunplus.

In 2000, China's Ministry of Science and Technology joined forces with the Shanghai municipal government to open the Shanghai Integrated Circuit Design

Industrial Center (ICC), the first Chinese industrial park dedicated to IC design. Thirteen design houses, including a joint venture with the Beijing-based China IC Design Center, have moved to the park, which aims to nurture local chip-design startups. The center will also offer design houses and universities a multi-project wafer-processing capability that handles many different designs with similar processing requirements. The approach aims to reduce layout and foundry costs for the prototype and low-volume products developed by local designers (Figure 5).

Design products can be generally divided into five sections: communication chips, ICs used in smart cards and memory cards, computer chips, and consumer chips. Consumer ICs more or less occupy the leading position. However, communication ICs and computer ICs are progressing in terms of speed. The representative products featuring high-technology level were 500,000-gate integration using 0.35μm Motion Picture Expert Group 2 (MPEG-2) compression encoder/decoder chips. Most high-end design products are being outsourced to Korea, Singapore, Japan and Taiwan. Some fabless companies expect to use low-end domestic foundries for manufacturing of more standard chips. Shanghai SyncMOS Systems (SSS) plans to subcontract manufacturing to Wuxi-based Huajing, with its six-inch line installed by Lucent Technologies. There's also Shanghai's ASMC foundry, partially owned by Philips and Nortel. In June 2000 the China State Council promulgated a policy to encourage capital and human resource investments in the software and IC industries.

Huajing Corporation Profile

Huajing Three Stages of Development

China Huajing Electronics Group Corporation was founded on August 4 1989, as a merger of Factory 742 and Research Institute 1424 (Wuxi Branch) into the Ministry of Electronics Industry and it has gone through three stages of development: founding stage, expanding stage and development stage.

The founding stage started with the establishment of local state-run Jiangnan Radio Equipment Factory on September 1, 1960. On December 24, 1962, the National Economy Committee approved the upgrading of Local Jiangnan Radio Equipment Factory and it became Jiangnan Radio Equipment Factory with factory code of 742. Then it became a state-owned enterprise run by the central government.

The expansion stage began from December 20, 1968 when Jiangnan Radio Equipment Factory merged with Wuxi Radio Industry School. June 25, 1985 saw the completion and national acceptance of the first production line for color TV integrated circuits, one of the major projects for the nation in that period.

The development stage: In March 1987, Microelectronic United Company was founded when Jiangnan Radio Equipment Factory merged with Wuxi Branch of 24 Research Institute of Electronic Ministry. From then on, the company had the full capacities of R&D, manufacturing, and sales and services. Within the year, an updating project for transistor devices production was completed, which was a major national project. China Huajing Electronics Group Corporation was officially approved on April 14, 1989, and founded in August. On June 25, 1994, Wuxi Microelectronics Project, a

national project was accepted by the state. The upgrading project for the bipolar integrated circuits production line for videocassette recorder (VCR) was accepted by the state in 1996. The "908" Huajing Project, which is a super-large integrated circuit production line, started in 1998.

People

Huajing has 4,393 employees with 2,309 engineers and technicians, accounting for 53 percent of employment. Eight percent or 349 are experts, including 39 professors. 716 are engineers (10.3 percent), and 1,244 are assistant engineers and technicians, accounting (28 percent). 2,084 people are engaging in production, accounting for 47 percent of total employment (Huajing Document [2000] No. 6).

Products

Huajing is one of the leading enterprises in microelectronics industry, engaging in R&D, manufacturing, sales and services of two major product lines: integrated circuits and discrete devices. Leading products include (1) high-medium-and-low-power transistors, chips and final products for household appliances, green lighting, communications, industry automation, (2) bipolar analog ICs for information household appliances, communications, industry automation, and (3) MOS ICs for household appliances, electronic watches and clocks, communications, toys, and industry automation. Subsidiary products include (1) Silicon materials and epitaxial wafers, (2) precise molding dies, (3) lead-frames for discrete devices and ICs, (4) photo-masks, and (5) hyper pure water, N_2, H2, O_2 and industry gases.

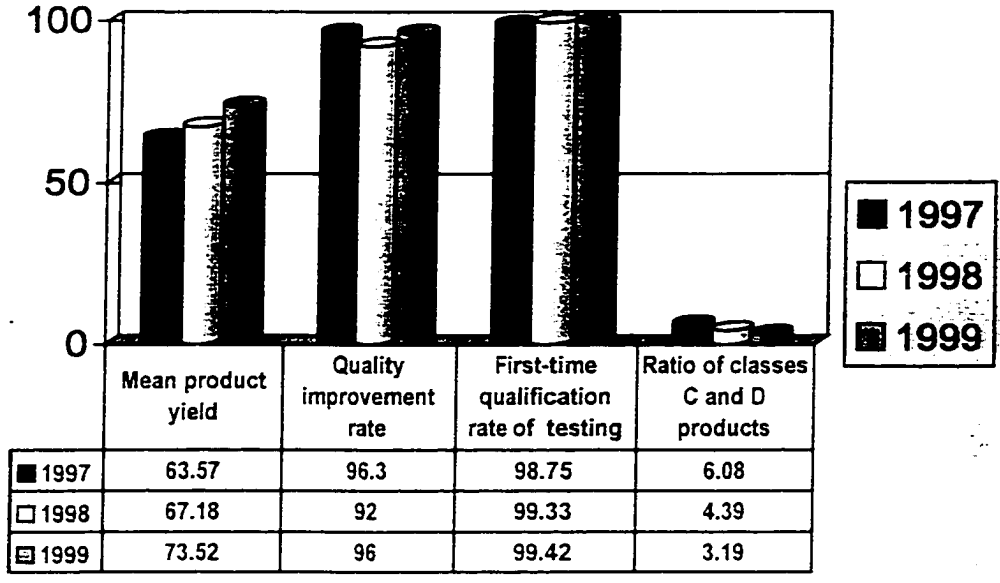
Quality

Huajing received ISO9001 certification in 1993. According to the international standards, Huajing is reviewed biannually by an international agency for its quality work and management, and reevaluated twice a year for renewal of its certification (Figure 5). The quality policy is: "Quality first, customers highest. Based on strict, scientific and systematic quality management, to provide the customers with satisfactory products and services."

Production Capacity

1. Huajing's production capacity in discrete devices has the highest production volume and widest variety in China:
    - φ3": 120,000 wafers/year;
    - φ4": 300,000 wafers/year;
    - Key technology includes Mesa and planar high breakdown voltage, PCT NPN and PNP planar technology.
2. Huajing has the best development and production capacity in Bipolar IC in China:
    - φ4": 150,000 wafers/year with 3μm PCT planar process,
    - φ5": 20,000 wafers/year with 2μm ANSA process.
3. Huajing's production capacity in MOS ICs include:
    - φ5": 120,000 wafers/year with 2-3μm Si-gate CMOS process

- φ6": 100,000 wafers/year with 0.6-1.0μm Si-gate CMOS process.



	Mean product yield	Quality improvement rate	First-time qualification rate of testing	Ratio of classes C and D products
1997	63.57	96.3	98.75	6.08
1998	67.18	92	99.33	4.39
1999	73.52	96	99.42	3.19

Figure 5. Product quality in recent three years.

Structure

The current company hierarchy (Figure 7) can be divided into seven sections: four controlled stock holding companies, four stock holding companies, six subsidiary companies, five subsidiary plants, two branches in Shenzhen and Zuhai, three assisting centers of technology, information and material supply, nine functional departments, including Complex Management Department, Planning and Operation Management Department, Accounting Department, Technology and Quality Department, Labor, HR and Education Department, Monitoring, Auditing and Security Department, Politics Department, Labor Union, and Logistics Department.

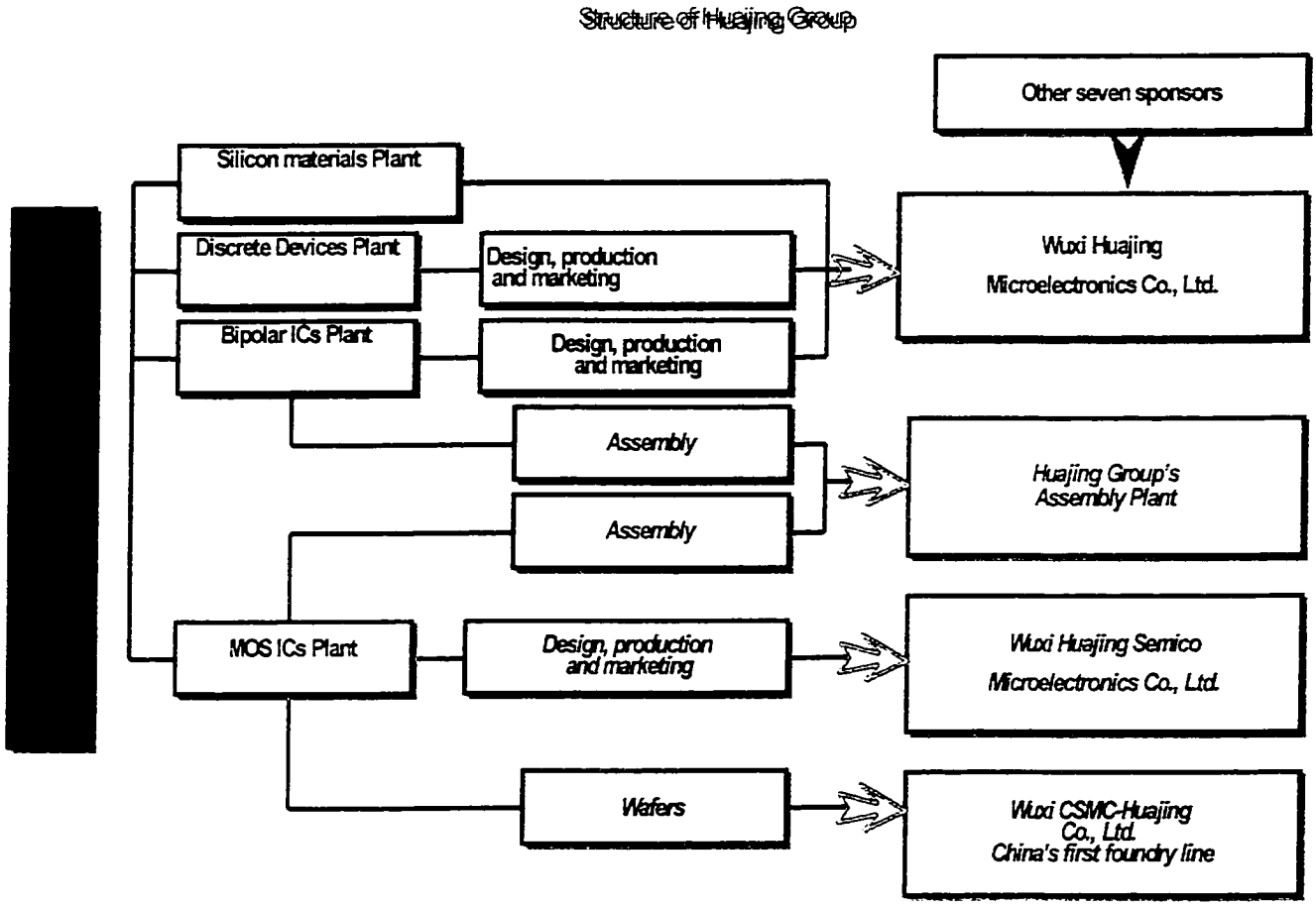


Figure 6. Evolution of Huajing Structure

Customers

Huajing has over 2000 customers domestically such as Konka, Changhong, HiSense, TCL, Amoisonic, Great Wall, Haier, Panda, Chunlan, etc. Overseas customers include Hong Kong, Taiwan, Japan, Singapore, India, Indonesia, and South America (Table 5).

Table 5 The top 10 of China's 100 largest electronics enterprises in 2000

Order	Company	Sales	Profit	Note
1	Legend	2029181	49511	
2	Shanghai Broadcast and TV	1745656	137304	*
3	TCL	1324054	67930	*
4	Konka	1315070	62466	*
5	Changhong	1304684	66540	*
6	Great Wall Computer	1209020	26787	
7	Beijing Post and Telecom	1147537	62261	
8	HiSense	1065221	23351	*
9	Panda	1034812	40373	*
10	Shenzhen Huawei	1021473	170096	

- Huajing's customers (From *China Electronics Daily*)

Strategic Challenges

Government Control and Intervention

Government control and intervention were the major source of problems for Huajing. When government made decisions for firms, it did not consider much of what happened in the marketplace, and did not do a good job in feasibility studies for products, manufacturing equipment, and market needs. The government's decision for investments mainly based upon political considerations, which may not yield profit for firms. This was especially true with Huajing before 1997. The government realized that microelectronics is the core of a nation's technological development, and decided to build up China's microelectronics capability. It made decisions that Huajing would start two huge projects: 75 Project and 908 Project for importing MOS ICs production within ten years beginning from 1986 to 1995, which cost more than 2 billion *yuan*. Yet, the government decision makers did not fully understand that MOS development changes very rapidly, and its technological life cycle is three to four years. However, it took Huajing almost ten years before the production line started operation.

Financial Constraints and Lack of Autonomy

The government gave orders to Huajing to start the projects, and said that it invested money for these projects. In fact, the government did not become a true investor. It just gave an OK to banks to loan the needed money to the firm. Even though Huajing borrowed the money from banks, and had to pay back both the capital and the interest, Huajing was not in a position to control the money, which was controlled by the government agencies. These agencies would impose a lot of constraints for using the money, and Huajing could not get the money when needed for doing the projects. For example, the investment in the 75 Project of 0.1 billion *yuan*[3] was delayed up to five years before Huajing got all the loans, and, before the MOS line was evaluated and accepted, five inch and six inch production lines had already become obsolete in the world market.

Disconnection between R&D and Manufacturing

When the government ordered Huajing to implement the 75 Project and 908 Project for MOS ICs production, it also set up several R&D institutes. The purpose of these institutes were to design products for MOS production. However, up until the date of this research study, design institutes had not provided any successful products, thus imposing enormous pressures on Huajing.

[3] 1 USD = 8.25 *yuan* Renminbi (RMB, meaning People's Money), Chinese currency.

External and Internal Obligations

Huajing was in the worst situation between 1996 to 1997. The loan for purchasing the state assets for the 75 Project and 908 Project was 0.76 billion *yuan*. The total interest was as high as 0.24 billion *yuan*. Because of the slow progress in establishing production lines of those two projects, and then the lack of successful products, the state assets suffered a great loss. However, Huajing had to pay back both the loan and the interest. Huajing was deep in debt for 1.73 billion *yuan* at the end of 1998.

Huajing had the same defects that most state-owned enterprises (SOEs) had: the responsibility of being "a small society" and providing "small and complete" services. There were 26 production and non-production plants, dependent firms, subsidiaries, and branches inside Huajing. Huajing performed all the operational (manufacturing and service) functions and activities were completed inside the firm. Huajing was also required to perform most of the social functions and provides supporting social institutions such as nurseries, kindergartens, elementary and middle schools, a hospital, and community committees. In 1997, when orders came down from both the state and the province that Huajing start to transform its operating system from an SOE, Huajing was in such bad condition that it was not able to pay wages for its employees (Table 7). With the defective institutional rigidity and lack of financial support, Huajing's leaders faced the challenge of changing its corporate structure.

Table 6. Operation Index for 96, 97 and 98 (in 00,000)

	1996	1997	1998
IC Yield	5516.64	7319.26	8056.74
Discrete Device	12775.29	15654.03	19437.16
Sales Income	36048.58	38799.22	43080.01
Receivables Collected	43200.98	43870.33	49889.70
Sales Profit	927.00	-5946.00	-932.00
Total Profit	-19638.00	-17026.00	-13650.00
Tax Paid	1582.00	1926.00	2804.00
Interest Expense	4959.00	5814.00	5616.00

Strategic Responses and Strategies

Realizing that if no fundamental transformation was made the firm would not survive long in the market, President Wang and his management team started to take actions toward the goal of turning Huajing into a competitive modern enterprise group. Knowing that Huajing could not financially and politically afford to start the transformation of the whole group all at once, Huajing management made the decision for progressive change. The first step was to simulate operations on the marketplace for each of its plants and subsidiaries. They established relatively independent accounting systems, functioning as cost centers to take care of sales, expenses and profits. Once the plants and subsidiaries learned how to operate on their own, their operating systems would be changed into those of modern corporations. After three years' practice, this so-called "upward transforming approach" has achieved tremendous success (i.e. progressive corporate system transformation is moving from local strategic units to the enterprise group).

Three Major Strategic Responses

The first strategic response to change the Huajing's ownership system required government help and creditor banks to convert debt into stock. With the help of the central government, Huajing was able to change its affiliation from the Electronics Ministry in Beijing to the local Wuxi Municipality, which established the Microelectronics Hi-Tech Park for Huajing and provided a favorable operational environment through its local policies. In January 2000, Huajing's new corporate form, the "China Huajing Electronics Group Ltd.", was presented to the central government for approval. This new organization was controlled by the Wuxi Asset Management Company, which consisted of the Wuxi State Asset Committee and creditor Banks (Table 3). With the help of Wuxi Government, Huajing planned to get rid of its social institutions such as Huajing Elementary School, hospital, kindergarten, community committees and Estate Company. This alone could save 3.4 million *yuan* per year.

The modern enterprise system would be used as the second strategic response after the system transformation was completed. The organization would be run strictly according to the state corporate law and firm regulation. Power and responsibilities of the stockholders, board of director, supervision committee and management would be clearly specified so that owners, managers and producers would know their roles in the organization. The government no longer made decisions for the organization, and instead played its role through its representation on the board. Only in this way, could the right relationship be built between the government and the organization.

The third strategic response was through asset restructuring and system transformation, thereby the right internal relationship between Huajing headquarters and its subsidiaries would be established according to the requirements of the modern corporate system with clear definition of ownership, authority and responsibility.

Huajing's Turnaround Strategies

Management realized that Huajing would not survive without a fundamental transformation. President Wang and his management team decided to turn Huajing into a competitive modern enterprise. Knowing that Huajing could not financially and politically afford a complete transformation of the whole group, management decided for progressive change. The first step was to build scenarios for each of its plants and subsidiaries. They established relatively independent accounting systems with responsibility centers for sales, expenses and profits. After plants and subsidiaries learned the new accounting system, their operating systems were restructured. After three years, this "upward transforming approach" moved from local strategic units to the enterprise Huajing group.

Restructuring the Corporation.

As previously noted, to change Huajing's ownership system required government help to convert creditor debt into stock. With the help of the central government, Huajing changed its affiliation from the Electronics Ministry in Beijing to the local Wuxi Municipality, which established the Microelectronics Hi-Tech Park to give Huajing a more favorable operational environment through its local policies. In January 2000,

Huajing asked the central government to allow the company to be restructured into "China Huajing Electronics Group Ltd." This new corporation was controlled by Wuxi Asset Management Company, which consisted of the Wuxi State Asset Committee and creditor banks (Table 7). With the help of the Wuxi government, Huajing planned to get rid of its social institutions such as Huajing Elementary School, hospital, kindergarten, community committees and estate company. This was expected to save 3.4 million *yuan* per year.

Table 7. Stock Structure for China Huajing Electronics Group Ltd

	Stockholding Institutions	**# of Shares**	**Percentage**
1	Wuxi Municipality State Asset Management Committee	123,061	59.01
2	Xinda Asset Management Corporation	45,867	36.38
3	Great Wall Asset Management Corporation	5,641	2.70
4	Huarong Asset Management Corporation	3,980	1.91
Total shares of China Huajing Electronics Group Ltd		208,549	100.00

The new organization would be run according to the state corporate law and firm regulation. Power and responsibility of the stockholders, board of director, supervision committee and management would be clearly specified so that owners, managers and producers would know their roles in the organization. The government would no longer make decisions for the organization, but would be represented on the board. Through asset restructuring and system transformation, the ownership, authority and responsibility of Huajing headquarters and its subsidiaries would also be clarified according to the requirements of the modern corporate system.

Restructuring MOS Operation

The MOS IC plant was the central piece of Project 75 and Project 908, which put Huajing into its desperate financial situation. While the MOS plant became a life-threatening issue for Huajing, there was no way to sell or liquidate it. Though production volume was low, the high-tech machines could not be shut down. The energy costs, depreciation expense, and interest expense were enormous. After careful study, Huajing managers adopted strategies unheard of in managing China's state-owned enterprises. They divided the plant into three sections: design, assembly and wafer production, and dealt with each section separately.

Restructuring MOS Wafer Manufacturing.

In 1998, the MOS manufacturing line was contracted to Hong Kong CSMC. CSMC's head, Peter Chen, has a Ph.D./EE from Cornell University and was one of the MOS inventors. He worked in California Silicon Valley before starting Hong Kong CSMC. While CSMC's contract covered only the utility and labor costs, it still lost 7 million *yuan* in 1998. In 1999, Chen turned the plant around and the monthly average profit was 1.5 million *yuan*. On August 1, 1999, Huajing and Hong Kong CSMC established Wuxi CSMC-HJ Co., Ltd. as a joint venture (49:51) with an investment of $6 million USD.

In 1998, Huajing completed the transfer of Lucent Technologies' 0.9μm CMOS Very Large Scale Integrated Circuits technology. By 2000, Huajing produced 70,000 wafers of 229 different integrated circuits on the production line using the sub-micro technology from Lucent. The maximum monthly production level exceeded the projected

capacity. Huajing has also developed more than 30 new technologies with higher than 95 percent first time success rate and the average customer return rate currently at 1 percent and decreasing. In August of 1999, this production line received the stringent QS9000 certificate by the audits of the international company DNV. At the same time, Huajing developed 36 new MOS products for applications in fax, remote control, instrumentation and telephone, resulting in accumulated sales of 133 millions RMB (about $17 million U.S.). In 2000, these wafers were also qualified through the stringent Lucent Technologies Bell Laboratories quality and reliability procedures to be used in the production of 5ESS at the Lucent Qingdao Joint Venture with China.

The company was China's first foundry for MOS wafer fabrication with φ6" 20,000 wafers/month using a 0.5-μm CMOS process. In November 2000, one third of the employees had at least bachelor degrees and all of the technical staff received long-term training in internationally famous organizations such as Toshiba and Siemens.

Restructuring of MOS Design Section.

Wuxi Huajing Semico Microelectronics Co., Ltd. (SEMICO) was established on the basis of the MOS Design Institute and Test Center. Wuxi Huajing Semico Microelectronics Co., Ltd is a fabless IC product company. SEMICO's goal was to become a first-rate high-tech IC company in three to five years and raise funds in the Chinese or international stock market to fund expansion and growth. Three parties invested 10 million *yuan* in cash. SEMICO provided a new model of ownership with 55 percent of shares held by employees and managers thanks to the help and support of the Wuxi government (Table 8).

Table 8. Stock Structure for Wuxi Huajing Semico Microelectronics Co., Ltd

	Investors	Amount (*yuan*)	%
1	China Huajing Electronics Group Corporation	4.5 million	45
2	Huajing Employee Stockholding Committee	3.5 million	35
3	23 Managers and Core Technical Staff	2.0 million	20
	Total	10 million	100

SEMICO's goal was to serve the fast-growing information industry of China by developing IC products (Figure 8). Using its R&D resources, SEMICO developed and fabricated digital, analog, and mixed signal ICs for applications in telecommunication, consumer electronics, and other industrial sectors. SEMICO's development roadmap is shown in Figure 5. It developed 3.0-2.0μm, 1.5-0.8μm and 0.6-0.35μm design technology (CMOS, Bipolar and BICMOS), established high-speed and low power gate array and standard cell libraries, and also built its own microprocessor control unit (MCU) core. The main products evolved into over seven series with over 50 types. The company's sales target is shown in Figure 9.

It had advanced VLSI design and testing technologies, design personnel with rich experience and knowledge, and advanced EDA (electronic design analysis) tools. Around 100 design engineers accounted for 80 percent of its workforce, including professors, senior engineers or engineers with prior experience in VLSI designing and fabrication at noted IC firms. In a spirit of "pioneering, enterprise, practicability and mutual benefit", SEMICO was committed to "helping you maintain your stronghold in this ever-changing information era." SEMICO's quality policy was to "Pursue complete

customer satisfaction incessantly. Improve in quality and service constantly". SEMICO staff's behavior norms included:

Verbal elegance

Behavioral decency

Honesty & Trustworthiness

Dedication & Devotion

Solidarity & Cooperation

Compliance & Observance

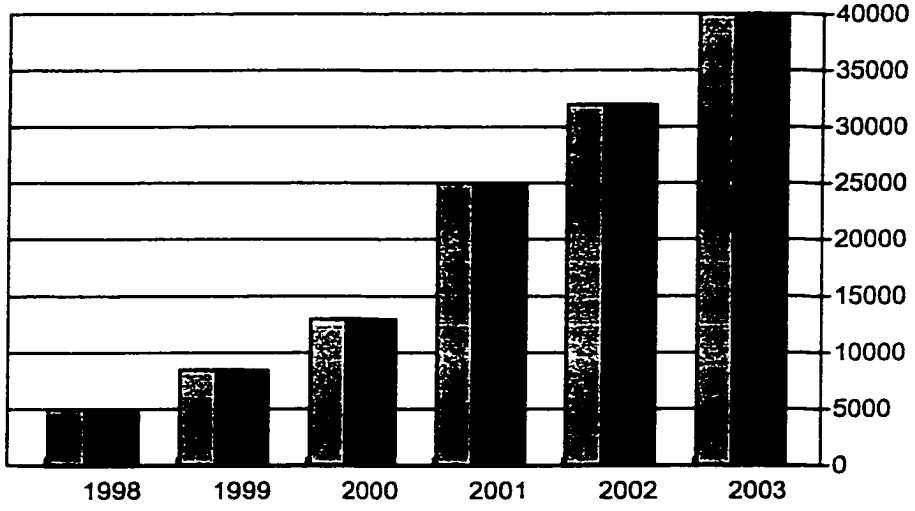


Figure 7. Sales target for Semico (in 00,000 *yuan*)

Restructuring of MOS Assembly Section.

Duplication was a deep-rooted strategy in China. During the 1960s, duplicate factories reduced the risks of loss in case of war. This ideology guided Chinese SOEs for decades. For example, the Huajing Bipolar IC Plant included a "back-end" package

assembly facility. Then, Huajing's MOS IC Plant included another package assembly section. Both assembly sections were under utilized. However, when one section was busy and the other was idle, no help was rendered unless the order was given from Huajing's top management. In 1999, the two sections were merged into the Huajing IC Assembly Co., Ltd. The key technologies were imported from Toshiba and Siemens. Its monthly production capacity was 10-15 million units with high pin number and high-density packaging. The company had 249 employees with most of the key technical staff trained in top semiconductor companies in the world.

Restructuring the Bipolar IC Plant, Discrete Devices Plant and Silicon Materials Plant

Huajing planned to merge the Bipolar IC Plant, Discrete Devices Plant and Silicon Materials Plant, and work with seven partners to establish Wuxi Huajing Microelectronics Stock Co., Ltd. (Table 9). The new company would issue stocks to generate capital for improving the design, manufacturing technology and scale of bipolar and discrete production.

Table 9. Stock Structure for Wuxi Huajing Microelectronics Stock Co., Ltd

	Partners	Investment Form	Investment (00,000 *yuan*)	# of Shares (00,000)	Percentage (%)
1	China Huajing Electronics Group Corporation	Net Assets	13,245.5	8610.00	86.10
2	China Electronics Information Enterprise Group Corporation	Cash	1,538.5	1000.00	10.00
3	Great Wall Industrial Park (Hui Zhou) Co., Ltd.	Cash	50.0	32.50	0.33
4	Youyan Semiconductor Material Co. Ltd.	Cash	200.0	130.00	1.30
5	Jiangsu Xinke Electronics Group Co., Ltd.	Cash	50.0	32.50	0.33
6	Lianyugong Huawei Electronics Group Co., Ltd.	Cash	100.0	65.00	0.65
7	Shenzhen Nanfeng Electronics Co., Ltd.	Cash	100.0	65.00	0.65

8	Huzhou Xongyan photoelectricity and Quartz Co., Ltd.	Cash	100.0	65.00	0.65
	Total		15,384.0	100,000	100

Strategic Planning for Development[4]

In managing Huajing's transformation, management had to operate under extreme financial limitations. Having spun off operations and focused on its core business, management's strategy for continued growth and development included:

- Acquire market share by using the firm's strengths to gain competitive edge in local markets;
- Evaluate internal strengths and weakness, and make appropriate investments;
- Minimize inventory and investments, and improve production for fast expansion.

Available resources were committed to markets of Polar ICs and Discrete Devices. Huajing concentrated on markets with quicker returns, i.e. growing markets where Huajing already had advantage. The investment strategies included:

- Only after Huajing has laid a solid foundation in its core industry, accumulated large amount of capital and resources, and achieved management competence, can it diversify to other areas.
- Huajing will concentrate its limited resources in areas that match its capability. "First become strong before getting large".
- Huajing must "avoid face-to-face conflict with powerful players in the market. Find a niche and survive before making rapid expansion."

[4] President Wang's Report on September 11, 2000 in Suzhou

- With low market penetration in China and a lot of undeveloped regions, Huajing has no reason to compete against strong players like Intel. China is a huge market for computers, and thus semiconductor products will grow rapidly for another decade or two.

Evaluation of Performance

Strategic Restructuring

Restructuring of Huajing was in process and proved to be successful in turning around the group corporation. Table 10 delineated the progress.

Table 10. Progress of Huajing Strategic Restructuring

Before Change	Change Mode	After Change	Progress as of Dec. 1999	Plan for 1st quarter of 2000	Plan for 2nd quarter of 2000	2nd half of 2000	1st half of 2001
China Huajing Electronics Group Corporation	Debts into stocks	China Huajing Electronics Group Ltd	Assessment In progress		Sign agreement for debts into stocks	Restructuring complete	
MOS IC Production Section	Joint venture with Hong Kong CSMC	Wuxi CSMC-HJ Co., Ltd.	Company operating			Each party investing a production line	
MOS Design Institute and Testing Center	Invested by Huajing and Huajing employees	Wuxi Huajing Semico Microelectronic Co. Ltd.	Company operating				Issuing stocks in Hong Kong
Bipolar Plant, Discrete Device Plant, Silicon Material Plant	Invested by 7 large organizations	Wuxi Huajing Microelectronics Stock Co. Ltd.	Assessment in progress	Complete registration	Company operating		Issuing A stocks to the public
Assembly plants of Bipolar IC and MOS	Assets restructuring	Huajing IC Assembly Co., Ltd.	Company operating		Seeking joint venture partners		Change ownership nature
Import & Export Company	Invested by Huajing	China Huajing Electronics Group Import & Export Co., Ltd.	Registration completed	Company operating			
Power Plant	Invested by Huajing Subsidiaries	Huajing Power Co., Ltd.			Complete restructuring and start operating		
School, hospital, Asset Company, community committees	Given to Wuxi Government		In progress		Separate school	Separate the rest	
Production Service Department, Life Service Department	Costing centers charging for services	Production Service Company; Life Service Company	In progress		Complete restructuring and operating		

Science and Technology Development

Huajing paid special attention to the development of Science and Technology because it understands that science and technology is the life-blood of the company. Huajing has a national-level enterprise technical center, post-doctoral research station. It also has advanced computer-aided design (CAD), computer-aided transcription (CAT), computer-aided manufacturing (CAM), and Computer Integrated Manufacturing System (CIMS) systems and technologies. Over 450 people work on technology development in cooperation with other firms in the industry, universities and research institutes, such as the Chinese Academy of Science's Semiconductor Research Institute and Microelectronics Center, Southeast China University, Electronics Science and Technology University, Tsinghua University, Beijing University, etc (Figure 8).

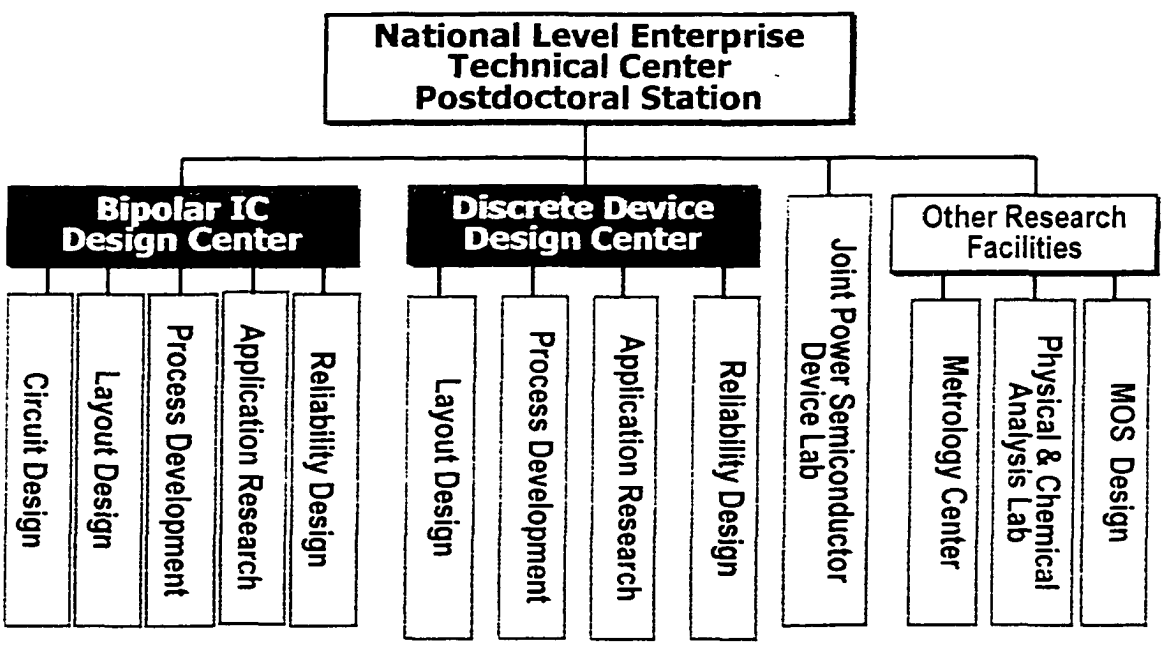
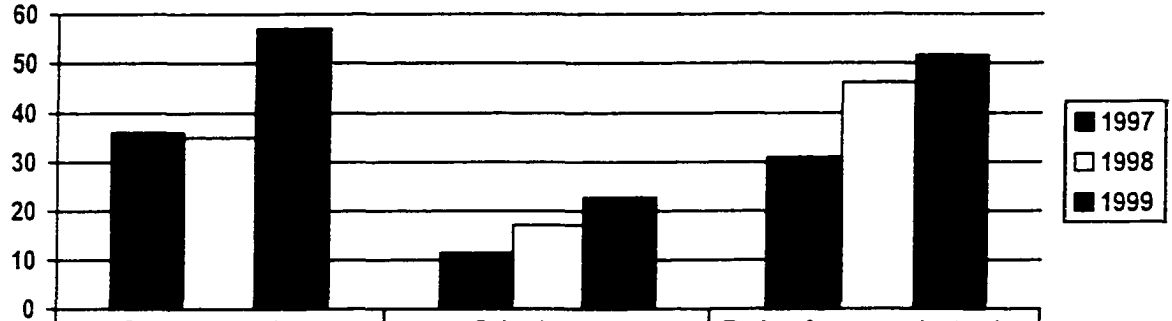


Figure 8. Huajing Science and Technology Level

New Product Development

Huajing developed 87 new products in 1999, including: seven provincial high-tech new products, two national new products, the sales of which were 414,256,000 units, for 227,283,300 *yuan*. And the new product sales ratio was 51.55 percent. In the same year, 57 new products were qualified (Figure 9). Huajing experienced 80 percent of economic growth from new product development in the last two years.



	Qualified product	Sales income	Ratio of new product sales
1997	36	11.392	30.98
1998	35	17.125	46.25
1999	57	22.728	51.55

Figure 9. New product development in recent 3 years

Operations and Performance

Ever since progressive restructuring in 1997, Huajing started its journey to revise its vitality. The transformation of operating system has reduced much government interference: government no long issues direct orders and makes decisions for Huajing operations. The economic reforms have put organizations right into the competitive market, while government subsidies for poor performers has continued to fall. Firms

have to rely on their own strategies, products and service to attract customers, and they have to work very hard to survive in growing competition. This market mechanism energizes organizations and their employees. The new compensation and pay systems have aligned the interests of the firms and their employees. Over the three years from 1998, Huajing enjoyed a 35 percent average growth rate. Figure 10 indicates the sales revenue for Huajing excluding the revenues of its subsidiaries.

Sales revenue from the first eight month in 2000 was 0.49 billion *yuan*, with a 49.13 percent increase against the same period of 1999. The estimated sales revenue for 2000 was 0.82 billion *yuan*, and the expected sales increase was 36.7 percent.

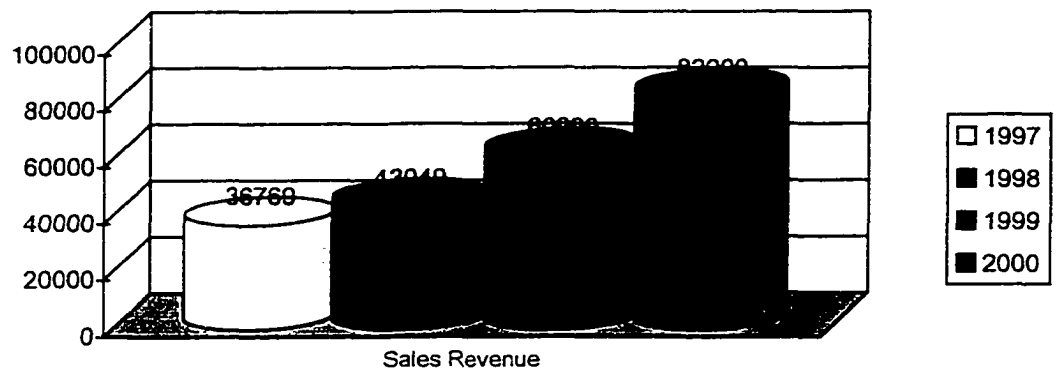


Figure 10. Sales Revenue for Huajing from 1997 to 2000 (in 00,000 *yuan*).

Achievements and Honors

Honorable Prizes

- Three second prizes for National-Level Science & Technology Advancements
- Three third prizes for National-Level Science & Technology Advancement

- Six first prizes for Ministerial Science & Technology Advancement (Ministry of Electronics Industry)
- 40 second prizes for Ministerial Science & Technology Advancement (Ministry of Electronics Industry)
- 42 third prizes for Ministerial Science & Technology Advancement (Ministry of Electronics Industry)
- One second prize for Jiangsu Provincial Science & Technology Advancement
- Five third prize for Jiangsu Provincial Science & Technology Advancement

Huajing Technical Achievements

- 1986, first 64K DRAM in China, which marked VLSI stage of China's IC technology
- 1991, State-Level Enterprise Technical Advancement Prize
- 1992, National May 1st Labor Prize
- 1993, ISO 9001 quality system certification
- 1993, first 256K DRAM in China
- 1995, first 1-μm IC in China
- 1998, title of Jiangsu Provincial Famous Product (IC, Transistor)
- 1999, Wuxi Famous Trade Mark

Proprietary Processes (Know-How)

- High breakdown voltage all-planar fabrication process
- High breakdown voltage high power transistor GPL fabrication process
- Bi-directional SCR fabrication process

- Medium and low power transistor PCT fabrication process
- LEC transistor fabrication process
- Low-noise microwave transistor fabrication process
- Ultra-high frequency high power transistor fabrication process
- Darlington transistor fabrication process
- Varactor fabrication process
- High resistance thick epitaxy process
- Ultra-thin epitaxy process
- PNP transistor series fabrication process
- Backside multi-metal-layer process
- Bipolar PCT process
- Bipolar double wiring process
- Conventional bipolar process
- Bipolar ANSA process
- APP power transistor fabrication process
- Reverse 1/2 PCT process
- Mesa fabrication process for high breakdown voltage high power transistors

CHAPTER V. BEIJING NO. 1 MACHINE TOOL PLANT

Company Profile

Beijing No.1 Machine Tool Plant (BYJC) is the largest computer numerical control (CNC) machine tool manufacturing firm in China. Since the founding of the factory on June 30, 1949, it has provided its customers with over 100,000 units of various milling machines in over 450 varieties, which involves small and medium-sized, heavy-duty and super-heavy-duty milling machines. Beijing No.1 Machine Tool Plant has over 700 technical engineers and technicians and occupies an area of 710,000 square meters that includes a building area of 430,000 square meters. It has a modern 4000-square-meter air-conditioned assembly workshop, a 2000-squrare-meter Flexible Manufacturing System (FMS) workshop, advanced machining equipment and high precision measuring instruments, and a high-rack storehouse with 4896 storage positions.

The main products are CNC milling machines, CNC lathe, vertical machining centers, horizontal machining centers and CNC plano-type milling & boring machines. In addition, 20,000 units of geological rigs in more than 20 varieties have been provided to our customers. Products of "Beiyi" brand enjoy a good reputation over 50 countries and regions over the world. Establishment of an advanced information platform on their computer network has allowed optimization of the enterprise's resources. Beijing No.1 Machine Tool Plant was awarded "Industrial LEAD Award" issued by the Society of

Manufacturing Engineers of U.S.A. This is the first time this award had been presented to a firm outside the U.S.

China's Machine Tool Industry

The growth of China's machine tool market is directly related to the growth rate of the Chinese government's investment in fixed assets and various new economic policies. In 1999, the government's investment focus was on infrastructure development, national grain storage facilities, environmental protection, and the renovation of rural power networks. In 2000, China added petroleum-recovery, inter-city high-speed rail, and - completion of the Three Gorges project and other power station projects.

These direct and indirect stimuli for machine tool consumption will continue to influence the machine tool market. In 1999, the total sales volume for machine tools and tool accessory products was about 45 billion RMB (5.5 billion dollars). The demand in China for CNC lathes and special-purpose machine tools continues to rise. Although the large-scale investment projects and renovation projects of the "Ninth Five-Year-Plan" were completed by the end of the year 2000, these projects continue to stimulate strong market demand for metalworking machinery in China. The total demand for machinery products in 2000 is estimated at 240 billion dollars.

The machine tool market was expected to continue to benefit from the fact that machine tool manufacturing companies are the prime equipment providers of the vast machinery industry. This demand will focus on the special-purpose and highly-efficient machine tools used in capital intensive manufacturing industries such as: automotive,

aviation, railway equipment and locomotives, transportation, ship building, electric power, electronics, telecommunications, and environmental protection.

It is estimated that the demand for CNC lathes and CNC systems will reach 15,000 machines in 2000, and 20,000 machines in 2005. In 2000 the market demand for machine tools was 5.42 billion dollars. By 2010, the market demand for machine tools will reach 7.23 billion dollars. The market increase will be concentrated on tools such as sophisticated CNC lathes. Foreign manufactured leading edge technology CNC lathes will account for a significant percentage of the projected sales growth.

The vigorous development of China's industry in recent years brought a continually increasing demand for machine tools. Foreign manufactured machines captured a large share of this market. According to a China Machine Tool & Tool Builders' Association report, during the 8th five-year plan period (1990-1995) the import of machine tools steadily increased to $2.2 billion USD in 1995. In 1996 the import value reached the record breaking level of $2.52 billion USD. This surge was driven by the belief that the Chinese Government would announce a cancellation of the tariff exemption on imported capital equipment at the end of the year. This indeed did occur. The import of machine tools in 1997 dropped down to $1.58 billion USD. Starting from January 1, 1998, the Chinese Government resumed tariff incentives and preferential treatment on imports of high technology and machine tools for foreign-funded projects. China imported 688 million USD worth of machine tools in the first six months of 1998, up 9.77 percent from a year earlier.

There has been a rapid increase in the demand for NC (numerical controls), and high-efficiency & precision machine tools of medium, medium-high, and high grades. According to a China Machine Tool & Tool Builders' Association report, the consumption rate of machine tools and the market share of NC and high-efficiency precision machine tools have increased from six percent to 30 percent of all machine tools from 1990-1996. Domestic production of similar grade machine tools has been insufficient to meet market demand, and, as a result, imports of foreign manufactured machine tools have increased dramatically during the past few years.

Beijing No. 1 Machine Tool Plant's Products

Beijing No. 1 Machine Tool Plant designs and manufactures small and medium-sized, heavy-duty and super-heavy-duty numerical control (NC) and computer numerical control (CNC) plano-type milling and machines, machining center, bed-type milling machines, knee-type milling machines, CNC lathes, special purpose milling machines etc. The products offers are:

1. Knee-type milling machines, universal milling machines and swivel head milling machines.
2. Bed-type milling machines and rotary table milling machines.
3. Plano milling machines, plano milling & boring machines, single column milling machines as well as double column milling machines.
4. CNC vertical milling machines. CNC plano milling machines and vertical or horizontal machining centers.

5. Various kinds of special-purpose milling machines.
6. Geological drills

These machines are widely used in metallurgy, mining machinery, railway, power generation, aerospace and aircraft and mould manufacturing. The plant also produces geological rigs that are widely used in mine prospecting and development of water resources.

Services

The Imp. & Exp. Corp. was approved by Ministry of Foreign Trade and Economic Co-operations and was founded in 1988, and has the authorization to import and export on behalf of BYJC. It is conducting international trades on the principle of mutual benefits and seeks for co-developments. This Corporation was awarded "Customs Worthy Enterprise " by customs.

The main business scope of the Corporation includes:

1. Import and export business of machine tools, such as machining centers, plano milling machines, CNC milling machines, conventional milling machines, and other electric and machinery products; Indirect export business through professional import and export corporations
2. Cooperative production projects
3. Machining according to drawings, samples, materials, Castings projects
4. Technical maintenance and services
5. Labor export and engineering contracting

Since it was founded twelve years ago, the products have been sold by direct export or indirect export through professional import and export corporations to more than 50 countries and regions, such as USA, Germany, Japan, Iran, and Russia, and the products are widely acclaimed by users and traders all over the world. In recent years, Beijing No. 1 Machine Tool Plant imported and adopted advanced technologies from developed countries through the Imp. & Exp. Corporation with the manufacturers and traders of Japan, the U.S.A., and Germany to co-produce CNC Lathe and CNC milling machine (including CNC super heavy-duty plano-type milling & boring machines) to meet needs of overseas customers. And at the same time, BYJC undertook projects for machining to drawings, samples, and materials, and to provide castings and machined parts for domestic and international customers.

Strategic Challenges

Globalization Challenge

One of the challenges in the machine tool industry comes from globalization. Among the state-owned enterprises, the machine tool industry suffered most from operating losses. The state opened the machine tool industry to the global market as early as 1994. Before then, products from SOEs accounted for more than 70 percent of the domestic market. But when the state allowed companies to purchase machine tools without government permission, foreign products rushed into the Chinese market like a flood because these products had superior features and functions with much better quality and lower prices than Chinese manufacturers. Since the Chinese government did not impose

any tariffs or taxes on imported machine tools, the domestic manufacturers suddenly found themselves without government protection and had to compete on equal ground with competitors from Japan, Germany, US, Korea and Taiwan. However, the state imposes restrictions on exported parts or systems for machine tool development. Firms in this industry await early entry of China into World Trade Organization (WTO), for it will eliminate tariffs and other restrictions that affect domestic companies exports.

Product Challenges

Another problem in enterprise development is the product orientation. The Chinese government realized the significance of the machine tool industry to the country's development. In early 1950s, machine tool manufacturing had been one of the 150 imported industrial projects for establishing the national industrial base from the Soviet Union. Machine tool manufacturing was regarded as the core industry for Chinese manufacturing, and 18 plants were built. But the state neglected the development of this industry between 1976 and 1996. This neglect not only hurt the national manufacturing capability but also research and development for machine tool products. During the twenty years, even though the government invested money ($37 million USD) in this industry, the money was not spent on the right projects. The advanced machine tool manufacturing system was not put in place, thus producing a wide gap between the Chinese machine tool manufacturers and those in Japan and Germany.

Japan and Germany were two nations defeated in WWII, and they had various restrictions in developing their own machine tool industry. In Germany for example, the

government supports the civil associations in developing machine tool techniques and technology since they are not allowed by the international treaty to invest directly in R&D of machine tool systems for corporations. New techniques and technology were then given to corporations without any charges or fees. The Japanese government took various covert actions in this endeavor. Fast development of the manufacturing sector for these two nations can be traced to the fast development of machine tool industry.

The United States fell behind these two countries because most of its machine tool plants were family owned and not able to compete against their foreign competition. This contributed to the decline of US manufacturing capability after the Second World War. Many of its machine tool manufacturing systems are now imported from Japan and Germany. These two countries are reluctant to transfer their most advanced technology abroad. The US has learnt its lesson, as is the Chinese government. Since 1999, the Chinese government established four numerical control machine production bases, which consists of Beijing No. 1 Machine Tool Plant, Shanghai Machine Tool Group, Shenyang Machine Tool Group and Jinan Machine Tool Group, thus creating a favorable environment for the BYJC.

Challenges of Reorganization

Restructuring is still a big challenge for state-owned enterprises. In BYJC, the improper structure manifested itself in two aspects. On one hand, the plant owns everything in its value chain, from casting, forging, and machining to assembly. The plant is big and comprehensive without any distinctive competence. On the other hand, the plant has to

take care of responsibilities for its society, i.e. the enterprises run society, as people say. BYJC has to run primary and secondary schools, dinning rooms, repairs residential houses for its workers, and manages affairs for residential areas. Problems such as a quarrel between a couple would be given to plant managers for mediation.

Manufacturing Challenge

The next challenge BYJC faces relates to the manufacturing technology and facilities for producing advanced machine tools. For example, the development of numerical control products has been constrained by the computer numerical control (CNC) system. Uutil now, no manufacturers in China can produce a reliable CNC system of high quality. Over the twenty years from 1976 to 1996, only 37 million US dollars was invested in the machine tool industry, and covered too wide a range of product developments without focusing on critical manufacturing facilities. Most of the production equipment in the plant was purchased in 1950s and 1960s.

Property Rights Challenge

Even though 100 percent of the plant assets belong to the state, it is not clear who is in charge of the machine tool plant. The Beijing Machine and Electronic Holdings Co. (BMEHC) decides on the plant general manager and gives approval to managerial appointments in other levels nominated by the plant manager, but the state does not give BMEHC authorization to manage the plant and deal with the assets. Sometimes, the Beijing Municipality government will issue directions to the plant. Since BMEHC has the "property rights in name only", it cannot effectively and fully exercise the owner's

rights, and it neither shows concern for and supports the plant nor guides and controls major enterprise activities, especially in balancing short-term behavior (Gao & Chi, 1997).

Several years ago, for example, BYJC proposed a detailed plan to modernize the plant, which cost about $120,500 USD, but it was rejected by the Beijing local authority because the project did not have "Chinese characteristics". Thus, the plant has operating rights, but does not control its corporate property or investments. The impact of this enterprise property rights structure means that the enterprise cannot adapt itself to the market. As a result, market mechanisms in the state-owned economy are incomplete, the current operating system is not effective, and the market regulatory role is weak.

People Challenge

How to keep people in the plant and motivate them to their best is a challenge, too. The turnover rate for junior technical staff is as high as 70 percent. The plant is humorously called a "post-bachelor base". The plant is a wonderful place for university graduates to put what they learned into practice and to systematically learn the manufacturing process. Within three years, they become experts, but the private and joint-venture enterprises then attract them away with higher pay, more than four times higher than that paid by BYJC. Those who remain at BYJC also suffer from underemployment. The company cannot pay the market price for its employees for two reasons. One reason is that before restructuring the plant and spinning off the strategically insignificant parts, there are more than enough people needed for operations. Money alone does not cure the

problem. Since the plant is not effectively and efficiently run, an increase in pay will result in higher costs for the operation.

Sales Force Challenge

Another challenge for BYJC is its weak sales force. They do not understand the concept of marketing. They do not have a clear idea of how the product can be promoted and sold in the marketplace owing to the conventional practice under the economic planning system in which the state took care of finished products. The marketing of machine tool products has its own features. It requires that the sales people have knowledge and skills in the product specification, service and maintenance of their products. To sell one machine needs participation of three people: a person from the technical department to explain the features and functions of the machine, a person from the service department to explain the warrantee and maintenance program, and a person from sales department to negotiate the terms and price with the customer. This has led to high sales costs. Besides, it is a normal practice that customers are turned away to competitors, not because of their dissatisfaction of the quality and price of the products, but because of insufficient knowledge and inadequate service by the sales force.

Strategic Responses

Property Rights Solution

In December of 2000, Beijing local authority changed the property rights for all state-owned assets. BMEHC would be given the full authorization to take charge of the assets of BYJC. The restructuring plan for Beijing No. 1 Machine Tool Plant will result in its

becoming the Machine Tool Group. The ownership for this group would be such that BMEHC will be the biggest shareholder representing the state assets, and other shareholders can be private investors, other domestic firms and foreign investors.

The Machine Tool Group would be run according to the Chinese Corporate Law. The board of directors will be the highest power organ for the group. The management process will be similar to that in western countries. This restructuring process will start at the end of 2000, and the mixing of functions between the government and the company will be terminated. Since this plant is located in the middle of the national capital, Beijing, it must avoid turmoil or disturbances to the stability of the society as a whole. It is estimated that it will take a year or two to carry out this restructuring plan. However, separation from the government will free the company to adapt to market demand. The company will no longer have to worry about government invention in its operations.

Focusing the business

BYJC also changed the organizational structure. The plant will spin off those subsidiaries that are not strategically important to BYJC, such as casting, forging and machining. Those operations made little or no money. However, once they can stand on their own and improve their management, they are expected to become profitable, like other private-owned companies specialized in manufacturing. BYJC will help these factories to operate independently both in terms of money, facilities and management skills with strategic alliances. In the future, many parts will be outsourced to these factories for production. The plant will only keep the R&D department, sales

department, assembly department and manufacturing departments for critical techniques and technology. Machine tool plants in the developed countries usually have around 200 people but can produce several thousand machines each year.

Employee Obligations

Since 1993, the employees have been cut from 9,700 to 4,000. Employment levels will be further reduced to 2,000 after the restructuring within a year or two. So far, BYJC has done a good job to help the unemployed workers by both providing training and giving them a lump sum of money for their services and resettlement. Having completed the restructuring, the plant will form a relationship with its employees based on contracts. The plant will pay a certain amount of money for its employees' medical insurance and pension benefits, but the responsibility will be shifted to society.

The plant has been enjoying a good national reputation for a long time for both its manufacturing capability and high quality. Most of the senior technical staff continue with the company, even though they can find high paid jobs elsewhere. Now the plant has negotiated a salary with them to improve their living conditions. Still their pay is much lower than the going market price. They stay because of their loyalty, and they understand the current situation. Meanwhile, they believe that after the reform, BYJC has great potential and a bright future.

Product Developments

BYJC has been working very hard to upgrade its machine tool products since high-tech manufacturing systems are still restricted from entering the Chinese market for political

reasons. For the last six years, restrictions have allowed BYJC to withstand fierce competitive pressure. The plant has heavily invested in development of new products. The plant has purchased advanced production systems and blue prints from Japan, Germany and the US in an attempt to build the Chinese machine tool industry based upon their advanced techniques.

Training Efforts

BYJC has made great efforts in training its technical staff. Several classes have been run together with universities to get people ready for computer integrating manufacturing production. The plant has a plan to send many of its key employees abroad to "wash their brains". They can see with their own eyes how other companies are managed and learn the rules of the internationally accepted game. When this new group is ready, changes will be made to the hard ware and soft ware of the manufacturing system, as well as to the perceptions and mindset of the people working there. At present, the plant has run the second-term training course for its sales people.

Product development

BYJC has also been working closely with universities that have advanced research facilities and equipment on some research projects. Thus the plant does not have to purchase all the facilities needed for research. For example, the plant has benefited from the computer integrating manufacturing system (CIMS) in Tsinghua University.

BYJC constantly introduces and applies world advanced technology and has established cooperative relationships with manufacturers in Japan, the United States, and

Germany to produce machine centers and CN super-heavy-duty plano-type milling machines. An agreement to co-produce high-level CNC machining centers was signed between BYJC and HITACHI SEIKI Co., Ltd. of Japan in October 1999.

Capital Investment

Before BYJC's stock can be publicly traded, the plant plans to make the best use of its land. The plant has an excellent location in the best part of the Beijing City, called the Golden Triangle. BYJC had an offer of $204 million USD for its land, and planned to move the plant outside the Beijing City to an economic development zone. This money will be sufficient to finance the first phase of restructuring before its public offering.

Evaluation of Performance

The evaluation BYJC's performance focuses more on is strategic orientation. Three accomplishments contribute to the survival of the plant against international competition: reform of the enterprise management system, adjustment of the product structure, and organizational restructuring.

New Information Systems

In order to improve the management level of the enterprise and meet the need of a market economy, an enterprise management information system has been established that includes the Computer Aided Design of products, Computer Aided Manufacturing and Integrated Computer Management. Beijing No. 1 Machine Tool Plant is one of the 100 enterprises in China approved for an "Enterprise Technical Center" by the state in 1995. In 1997 the plant obtained the ISO9001 Quality System Qualification Certificate.

The Enterprise Management Information System (EMIS)provides manufacturing resource planning (MRP) II to integrate sales, planning, production, procurement, inventory and accounting cost into a comprehensive system. It includes the following systems.

Closed-Loop Scheduling for Timely Product Delivery

- Using MRP to precisely schedule the timetable for the production process from raw material, manufacturing, to assembly.
- Using JIT philosophy, the standard parts are procured and stocked scientifically; the special parts are provided based upon daily production machine sets according to the production contract.
- Timely checking and monitoring production and assembly process, and emergency scheduling can be made for other workshops to finish the delayed production plan because of accidents.
- The workshop production is arranged in a cross and concurrent fashion.
- The data of product structure in the project engineering design system can be shared with, and the technical documents are transmitted electronically, so that the new products are managed and controlled by MRP in time.

Cost Planning and Control

Reducing Working Capital Cash Flow.

- Controlling reserved capital

- Purchasing capital is arranged according to MRP requirements for production phases, thus controlling purchasing quantity;
- Materials in the inventory is grouped in A, B, and C categories, with emphasis on controlling materials of A category that is of high price and large consumption;
- Materials kept unused for some time are sorted out for the design department to make a better use.

- Controlling items in production process
  - MRP planning is arranged base on (1) gross requirements of production in different phases minus current inventory, and (2) net requirements for supply purchase. MRP planning greatly cut down the working capital tied to the items being produced.
  - MRP planning provides precise schedule for material flow in production, and workshop material procurement and manufacturing are under control.
  - The semi-products are only provided to the assembly line based on assembly plan and BOM product structure.
- Cutting down working capital for finished products.

- MRP planning is adjusted based on the dynamics of contracts to deliver products on time and reduce the finished products in inventory.
- Market analysis is done to increase the accuracy for predicted production planning.

Strengthening Cost Plan and Control.

- Improving cost for production quota: the cost for parts is calculated based on product structure, material quota, and product per hour quota, and the cost for parts and finished products are accumulated.
- Calculation of targeted cost
  - Price for variable model products is quoted based upon ratio between cost and specification and function for the basic model products.
  - Estimating direct material cost after the design of a new product.
  - Estimating direct labor cost after the engineering design of a new product.
- Calculation of Real Cost

- Cost ratio per hour is calculated monthly according to the production expenditure and real production hours in each work center.
- Real cost is calculated based on the cost of each patch of parts, semi-products and finished products when put in the warehouse.

Quality Control and Responsibility Follow-up.

- Inspecting quality of for procured raw materials: the procured raw materials are inspected and stored with three categories: returned materials, repaired materials and qualified materials with associated documentations for each procurement.
- Production quality management in workshops
  - Production progress form is provided based on MRP planning and product documentation with a summary of good quality products and poor quality ones produced by whom.
  - Person responsible for quality is recorded with the product serial, and product serial is recorded in the sales contract.
- Follow-up Service Management
  - Following up customer feedback concerning product quality and handling procedures, and monitoring after-sales effects.

- Categorizing and analyzing customer feedback concerning product quality for future product quality improvement.

Assisting Managers in Decision Making.

- Comprehensive information inquiry
  - Company capital situation: capital used, payments receivables, sales income and profit
  - Production: production progress, utilization of facilities, and quality control
  - Competitors and suppliers: comparison of functions and prices for the firm's products with those for the competitors; Prices for materials from supplier and their reputations
- Simulation for decision making process
  - Adjusting targeted cost for the product: 1) decomposing product cost and purchasing expensive raw materials based on price comparisons among suppliers; 2) reducing work hours for the expensive labors, and 3) recalculate product cost to obtain customer satisfaction.
  - Adjusting delivery cycle: Using MRP to schedule production arrangement for critical path. Additional hours are scheduled for the parts that require longer time for production or rearrangement

is made after production assimilation to achieve the optimal solution for customers.

- Using modern enterprise management system and reforming internal cost structure: Based on inventory activities of inflow and outflow materials and information on cost, simulating marketing relationship among the headquarters and workshops for accounting purposes.

Product developments

BYJC's product structure has changed to apply computer numerical control system (CNC) to compete effectively on the global market. A high-level computer numerical control horizontal machining center model HB 500,cooperatively produced by Beijing No.1 Machine Tool Plant and HITACHI SEIKI Co., Ltd. of Japan, was introduced at the "China CNC Machine Tool Show" in Shanghai in August 2000. The CNC bed-type series milling machines developed by Beijing No.1 Machine Tool Plant were introduced at "the 5th China Machine Tool Show" in Beijing in June 2000. The machine features high carrying capacity, high torque, high efficiency and high performance. It is designed for die & mould machining and has an acceptable price.

Restructuring

Spinning off several factories has freed BYJC and made it more flexible in its strategic maneuvering. At the same time, the management can focus its attention on developing and producing high-tech products for global competition. Outsourcing the middle part of the manufacturing chain has greatly lowered the cost.

Honors

BYJC is one of the four machine tool enterprises listed by the State Machinery Building Bureau, which will be mainly supported by the Chinese government. It has attracted the attention of the national leaders of three generations. Chairman Mao Tsetong visited the plant in July 1958. President Teng Xiaoping inspected the plant several times. President Jiang Zemin paid two visits to the plant: one on August 18, 1989 when he became party head and on December 11, 1995 when he became president. Inspection from the state leader in China is an indication of strategic significance of the firm to the country.

CHAPTER VI. CHONGQING CHN & CHN CERAMICS CO., LTD

Chongqing CHN & CHN Ceramics Co., Ltd. was China's leading producer of fine china, having annual production output of 30 million supreme ceramics and revenues of 0.18 billion *yuan*. On the 50th birthday of PRC in 1999, CHN&CHN, as a brand name product, was the only tableware chosen for the state banquet for 5000 people. The company's premium quality even satisfied the requirements of Rosenthal in Germany.

Industry Competitive Situation Analysis

China[5] pottery, one of China's great discoveries in history, was recognized in the world for thousands of years for its beauty, design and shapes. It reflected the mystery and elegant taste of this ancient country in the Far East. Stepping into the 20th Century, China, the hometown of China, fell far behind such countries as Britain, Germany, and Japan – countries that were well equipped with advanced technology for producing fine China. Mainland China ranked No. 6 in the world in the ceramic business. Although China has been the first in ceramic production yields, and has exported as much as two thirds of the total ceramics to the world, the revenue reached only one fourth of the total income in the world's exporting ceramics market. China's poor quality and inferior products had caused its competitive failure.

[5] The legacy of the origin of the term China standing for ceramics goes back to 13th Century when explorers from the west came along the Silk Way to a small town named Tanlan in Jiangsi Province, China. They were attracted and amazed by the beauty of the ceramics there. From then on, the ceramics and ceramics production technique were introduced to Europe, and people called the ceramics China, coined from the sound that the Tanlan natives produced for ceramics.

Company Profile

Chongqing CHN & CHN Ceramics Co., Ltd. (CHN & CHN) was one of the organizations that suffered from competition. Ten years ago, all the products were manufactured in a shabby workshop and sold in local convenient stores or flea markets. Its quality and profit were ranked as bad as 1000 among the large and midsize firms in China. At that time, people hardly knew there was a ceramic manufacturer in the mountain areas of Chongqing. When Min Zhang, CHN & CHN's current CEO and Chairman of Board of Directors, was nominated as factory manager at the end of 1993, CHN & CHN was 10 million *yuan* in debt, and was on the edge of bankruptcy. In the strict central planning economic environment then, there was not much choice for a state-owned enterprise manager. He had neither control over the company resources, nor the authority over the factory personnel. The typical course of actions would be to make some incremental changes and wait for the government to decide the factory's destiny. President Zhang explained that he fought to save the firm, and had to take drastic actions to keep it from failing.

Strategic Challenges

Having analyzed both the internal and external environments, President Zhang and his management team understood very clearly that if they wanted to be successful in their turnaround, they had to gain the support of both the local and central governments. The only key to this support was to have practical and well-planned strategies and bold actions. Zhang's strategy from the start was to restructure the factory, renovate the factory manufacturing technology, and upgrade the production facility.

The biggest challenge was to change the structure of the factory so that it could be flexible and adaptive to the market needs. In his turnaround efforts, another hurdle was the capital needed to renovate the technology and purchase of equipments.

Firms require markets to survive and grow, and thus firms can never exist without its market. In China, however, firms and markets were artificially separated by the central-planning economic system. Today after twenty-three years of economic reforms intended to change China's economy into market economy, firms' capabilities in production and technology still determine what the they are going to provide for the market, not customer needs. In the Chinese ceramic industry, most firms are traditional workshops with low technology, manufacturing products of shabby quality and cheap price. There is often a misfit between the products supplied and products demanded, and the products available in the marketplace are barely accepted by the consumers. In recent years, substitutes and competition caused a rapid decline in the ceramic industry: products are hard to sell, costs are high, and thus there is little profit.

Challenge for Finding Customer-driven Strategies

CHN & CHN was challenged to change its product structure and innovate new products to satisfy the consumers demand. President Zhang pointed out that one of the weaknesses of most Chinese firms lay in product design, which drove a firm's technical innovation. Market research and studies were not utilized for design, and the designers did not know customers tastes and preferences or what was needed in the marketplace. This weakness was deeply rooted in the Chinese 'closed-door policy'. There was no

communication between the designers and consumers. This was especially true when Chinese firms dealt with international consumers. The designers had no chance to visit countries where they sold their products, let alone knowing what color or pattern was in fashion in that particular region.

Challenge for Cost Management and Price Strategy

Traditionally, firms made pricing decisions based on cost and expected markup, customary pricing, or economic pricing; all of which completely ignored the requirements and needs of customers. It became a challenge for CHN & CHN to carefully analyze the market, to focus only on selected customers, and to make an appropriate pricing strategy to meet their needs. Pricing to the market introduced competitive pressure to the firm's cost management system. CHN & CHN wanted a pricing strategy that not only became adaptable to changing customer needs but also worked as a controlling mechanism for its operation's management.

Challenge for Product Quality Management

CHN & CHN realized through years of practice and experience that good quality products were consistently reproduced design specifications that satisfied the customers' needs. While modifying and changing ceramic products could contribute to achieving this goal, more important was the shared value among employees that everyone in the firm was a quality controller. At the same time, the firm needed to know both the customers and their changing tastes. "Good quality" as President Zhang said in our

interview, "was not only the fundamental basis for firm reputation but also the intangible asset for sustained advantage in competition."

Challenge for Creating Brand Name and Company Reputation

In the past few years, CHN & CHN gained competitive edge over its rivals on quality, pattern design, and product shape and variety. However, it was highly possible for firms with advanced technology to catch up and imitate CHN & CHN. The goal for CHN & CHN in the ceramics business was to create a famous brand that was Number One not only in the Chinese and Asian markets, but in the world market. President Zhang explained that it took several decades for firms in the traditional manufacturing businesses to establish their well-known brand in the world. In the Chinese ceramic industry, there was no famous brand name because Chinese firms in the past did not realize the significance of the brand effect. China was the home for ceramics, and people only knew that places like Jingdezhen, Tangsan were well known for quality ceramic products with good designs. But people could not name any firm that had a famous brand of ceramics. Thus, CHN & CHN needed a detailed brand creation strategy to help sustain its competitive advantage.

Challenge for Establishing Sales Network

CHN & CHN planned to set up a national operation network to increase its market share, while expanding its business scope to Asia and other global markets. CHN & CHN needed strategies for both the internal national markets and international markets. Effective and flexible marketing strategies were the key to success.

Strategic Responses

Restructuring and Rejuvenation

When facing bankruptcy, people in CHN & CHN carefully studied and analyzed why they failed and how they might survive. They came to realize that the major reasons for their failure rested with their low technology manufacturing facilities, products of low quality, and low-end market concentration. Lead by President Zhang, then vice factory manager, the management team decided on a three-step rescue plan: technical renovations, restructuring of ownership, and the purchase of high-tech manufacturing facilities.

Technical Renovation

During the early 1990s, technical renovation plans of SOEs' had to be approved by the central government's ministries before they could be put into practice. CHN & CHN was not on the Ministry of Light Industry's list of firms that qualified for technical renovation during the period of the Eighth Five-Year National Plan (1990-1995). Zhang was not discouraged and, with his team, prepared a detailed plan of how the firm could improve itself with high speed, high standard and premium ceramics. He went to Beijing with the plan. His courage, powerful will to turn around the company, and his well-planned strategies deeply moved those experts for assessing qualifications of technical renovation. Finally he got an opportunity to present his plan to the Ministry's decision makers, and they all agreed that the plan was not only feasible, but also reliable in its scientific nature. Thus, CHN & CHN was put on the list, and able to start the innovation process.

Now that CHN & CHN had the go-ahead for its plan, Zhang needed a large amount of money to carry out his plan. He tried to persuade banks and other financial institutions to make loans for his plan, but was turned down due to the risks involved. As the last resort, he decided to visit Premier Zhu Rongji, who was then the vice premier responsible for Chinese production and finance. Determined, Zhang waited at the gate of the State Economy and Trade Commission for a whole week before he met a top leader who passed Zhang's plan to Premier Zhu. Having studied the plan, Premier Zhu appraised the plan as bold and feasible, and believed that it was worth trying. He supported Zhang with 4 million US dollars from the reserves of the State Economy and Trade Commission.

Restructuring

Zhang knew when he obtained the policy from the Ministry and money from Premier Zhu that he also needed a good operation mechanism to guarantee his long-term success. He had taken advantage of the state-owned enterprise in getting the policy and money he needed, but he needed more money and management expertise to implement his plan. The optimal solution was to find a foreign partner and change the firm ownership to a joint adventure, which could bring the firm many advantages: money, management expertise, product information, international markets and distribution channels, tax privilege[6], and more autonomy of the management and much less government intervention.

[6] In order to attract and encourage foreign investment, the Chinese tax regulation then stated that the joint venture enterprises could enjoy a two-year tax exempt and three-year half tax duty exemption.

Zhang and his team worked out their goals and expectations for a partnership and contacted potential investors in Britain, USA, Germany, Japan, and Hong Kong, and visited some of these countries looking for partners. Most of Zhang's potential investors would make the same comment after their visit to the old factory: Investing in CHN & CHN would be like throwing money into a fire.

In 1991 at the Guangzhou Ceramics Exhibit, Zhang met Zhaofeng Li, President and Chairman of Board of Directors of Hong Kong Zhaofeng Ceramics Group Corporation, who exhibited his ceramic production facilities. Li had dreamed of becoming the king for the Chinese ceramics business, and had been looking for a competent domestic partner. Naturally, Zhang's capability, confidence and sincerity and Li's ambition matched very well. They made a partnership agreement right away, and later signed the joint venture contract where the party from Hong Kong invested $1.25 million USD and CHN & CHN invested $3.75 million USD. Chongqing Zhaofeng Ceramics Co. Ltd was established.

Purchase of advanced manufacturing facility

The first move of the joint venture was to upgrade its production capability for premium quality products. At that time the Chinese manufacturing capability was low, and the manufacturing machines were big and hand controlled. The product quality was inconsistent and lacked fine-tuning. Hence, Zhang and his joint venture decided to import foreign manufacturing equipment. Their guiding principle for the purchase was to start high, and expect the facility to be among the best for at least 20 years. They did comprehensive homework for comparing ceramic manufacturing machines in the

international markets, and finally decided that Germany had the best equipment. CHN & CHN became the leading ceramic manufacturer in China with the most advanced automated production line.

Strategies for Creating Premium Products with Supreme Quality

A manufacturer's reputation comes from its premium products and consistent suprior quality, while consistent product quality depends on both reliable machines and people. Zhang's operation motto was: "Employ the best people, use the best manufacturing facilities, manufacture the best products and create the best organization". In order to produce the best quality products, CHN & CHN also purchased the formula for premium ceramic products from the Germany Ceramic Research Center, a formula specifically made for using Chinese raw materials to meet the standard for German five-star hotels. CHN & CHN also purchased 30 sets of blue prints for 30,000 German Marks from the best German designers of ceramic patterns.

In order to improve the product quality and obtain the leadership position in the ceramics market, Zhang implemented three engineering projects: a hardware engineering project, a software engineering project, and a human resource engineering project.

Hardware Engineering.

Xianlin Zheng, the President of Light Industry Ministry acclaimed that "this has been what we have dreamed for years!" after inspecting the performance of the first manufacturing line in CHN & CHN. Indeed, CHN & CHN has been equipped with the most advanced manufacturing facilities in the world from Germany and Italy. Computer

Controlled Direct Firing Fast Roller Kilns made by Heimsoth in Germany, which was the first kiln of high technology made after its birth from the experimental lab.

CHN & CHN also purchased an Automatic Isostatic Press Machines for oval plate, automatic production line for cups and plates, and an Automatic Glazing Line from Dorst in Germany. Other world first-class equipment included Fast Firing Shuttle Kilns, Decorating Firing Roller Kilns, High Pressure Casting Lines, Automatic Glazing Lines, etc. The integration of advanced technologies and machinery has helped to make the factory become the leading enterprise of the ceramics industry in China, which has achieved industrialization and automation.

Software Engineering.

Based on the problems of slow information, long time development of new products, low level of information standardization for the management, Zhang realized that hardware was a necessary tool for manufacturing, but software was the core element in process innovations and functionalities that make products valuable to customers. The two strategic issues he spent much of his time chewing in his mind were 1) How can a traditional manufacturing company harness superior IT to gain competitive advantage in strategic business process? 2) What can IT contribute to corporate success?

As early as in 1995, Zhang started to apply the Contemporary Integrated Manufacturing System (CIMS) in the traditional ceramic production (CPCIMS), which was listed in the national "863 High-Tech Plan".. His goal was to use information technology and modern management technology combined with manufacturing

technology to all of processes, including design, business and manufacturing processes, of his enterprise, through information integration process optimization and resource optimization to improve TQCS (time to market, quality, cost and service).

CPCIMS system helped realize the co-operation and designing integration for the shapes, patterns, technology and tools and then shortens the developing time for new products. The realization of the share and integration of the information for the ceramics manufacturers improve the managing flow and production efficiency. It also developed powerful supporting system such as computer network system, database system, and functional system such as ceramic product engineering design system (EDS) and management information system (MIS). The EDS included the sub-systems such as database management of computer-aided design (CAD) for the shapes, decals and mould, as well as computer-aided process planning (CAPP) for ceramic products. The MIS integrated the management system of the sales, production, purchasing, storage, accounting, and personnel.

Electronic Integration of the Computer-Aided Designing Process

Key challenges in R&D management, such as reducing development time and broadening technical expertise, have lead CHN & CHN to integrate both its own core processes and its development partnerships with universities, research institutes and other companies. Such data as CAD data, simulation results, work schedules, and project status information with tasks in the development process has been integrated into its engineering data management (EDM) systems. CPCIMS provides the three-dimensional designing for decorated ceramics through the integration of the CAD for shape and decal.

With the help of pattern design CAD system and mould CAD system, the ceramic product design and mold design have been integrated. CIMS also helped the integration between ceramic product engineering design system (EDS) and ceramic enterprise management information system via product data management (PDM).

Digital Technology for the Manufacturing Process of Ceramics Moulds

Ceramic manufacturing has high demands for product moulds. One set of mould can only work for a certain type of products, and there are so many varieties of ceramics. In the past, the traditional practice of making moulds depended on the operator's experiences and skills, and the cost of making moulds was enormous because of high failure rates. Application of ceramic mould CAD has completed changed the way ceramic moulds are made, and standardized and digitalized mould manufacturing process.

Technology of Production Planning and Management for Manufacturing Process

CIMS helped integrate ceramic enterprise information management with management process through management information system, which included management systems for purchasing, finance, production, and personnel.

Simulation Technology

The application of EDS to modeling for dummy ceramics products solves such key problems as the decal deformation for complex curves, positioning of decals and transparence of the decoration by three-dimensional designing. EDS systems test CAD representations of potential designs against anticipated variations in use without building physical models. Simulations often allow much less expensive and more effective test

information than the experimenter could possibly afford to achieve through physical models. The integration of CAD and simulation databases has served as a springboard to faster, simpler communication with engineering partners. A 3D CAD system with spatial geometric representation of objects can usually serve for this purpose. The use of simulation in assembly and production enables the production process to be adapted to the product much earlier in development, thus reducing manufacturing costs.

Manufacturing Engineering

CPCIMS now provides data gathering, analytical, and test capabilities for complex process design and manufacturing engineering. In process design, software allows inexpensive experimentation, yield prediction, workstation design, process layout, alternative testing, three-dimensional analysis, network manipulation, quality control, and interface timing capabilities that would otherwise be impossibly expensive. CPCIMS is especially helpful in allowing workers, technologists, and managers to visualize solutions and work together on complex systems. Further, knowledge-based system of CIMS now allows the design coordination, manufacturing monitoring, and logistics control needed to find and source innovative solutions worldwide.

Interactive Design

CPCIMS provides the central vehicle enabling the inventor-user interactions, rapid distribution of products, and market feedback that add most value to ceramic innovations. It allows multidisciplinary (marketing-manufacturing-development) teams to interact continuously with customers all over the world, capturing their responses through video, audio, physical sensing, and computer network systems. Through software, customers

participate directly in the design of new or customized ceramic products for the preferred patterns and shapes, colors, and decoration. Such customer participation is a crucial element in both lowering risks and enhancing the customer value of designs. More important, by designing "hooks" on CPCIMS to allow customers all over the world to innovate further on their own, CHN & CHN can leverage their internal capabilities enormously by tapping into their customers' sophisticated creative ideas.

In the past, it would take about a month to design, make, and deliver a new prototype ceramic sample to the customer for requirement confirmation before the customer finalized the order. This was made more difficult and more complicated for international customers because the sample could easily damaged on the long journey. At present, CPCIMS can entirely eliminate many traditional steps in the innovation process and can consolidate others into a simultaneous process. And it can provide the communication mechanisms and disciplined framework for the detailed interactions that multidisciplinary departments and their customers need to advance complex innovations most rapidly. This has cut development time and cost enormously. Through rapid 3-D "virtual" prototyping rather than conventional tooling up and physical delivery of samples, CHN & CHN reduces greatly the time needed for prototyping samples, which was one of the major reasons for customer dissatisfaction and loss of product contract.

Human Resource Engineering

Zhang explained that "Human capital is the core of CHN & CHN since everything in the firm is accomplished by people, and thus our organization is only as good as our

people". CHN & CHN not only attracted competent people from all over China but also develops and trains its employees.

CHN & CHN paid special attention to attracting people. As early as 1993, Zhang himself went to Jingdezhen, the world known place for ceramics, and investigated the best people in the ceramic business. As Zhang put it,

> "I went there without attracting any public attention, talked to people and studied who were on top of the cream for ceramic operation. Then I came to each of them, telling them the bright future they could have with CHN & CHN in their self-actualization. I promised them several things that were almost impossible at that time: 1) I would give them 10 times the pay they had with their companies then; 2) I would buy them a house for their families; and 3) I would change their resident status from a small town to Chongqing City. This was the first daring and pioneering act ever in Chongqing, which is one of the only four cities controlled by the central government thanks to the special approval from both the Mayor and the party secretary of Chongqing Municipality. So, I have all of them: the best in ceramic design, the best in furnace, the best in mold, and the best in product pattern and decoration. Had it not been for these people with the skills and experiences passed down for thousands of years in ceramic operation, CHN & CHN would not have made such brilliant success as for today."

This combination of the best western hardware and software with the best eastern intelligence and experiences proved successful.

CHN & CHN also attracted talents from other parts of the country. Some people in the top management team were recruited and selected from Shenzhen, China's special economic zone, a special lab for experimenting with the market-economy. The company also recruited MBAs and college graduates.

Employee development and training played a significant role in CHN & CHN's operations. Zhang took the lead in improving himself. He studied as a part-time MBA with Business School at Chongqing University. Regardless of his busy daily schedule, he took time and pains to finish his MBA program in the Fall Semester of 2000, and that could explain why he has been so successful in his course of actions. By that I mean not only the knowledge, which was crucial in guiding the voyage to successful performance, learnt in MBA classes, but also the strong mental will in pursuing a course right through to its end.

CHN & CHN kept sending its core technical and marketing staff abroad to study, and they were required to train other people when they accomplished their training so as to keep CHN & CHN people well acquainted with global development trends and changing customer tastes and preferences. CHN & CHN also runs Devil Training classes, which originated from Japan. Training focused on four managerial factors: new management ideology, good team spirit, good health, and good eloquence. People from top management team and middle management were sent to the training class held in Guangdong for six days with the youngest in their early 20s and the oldest in their 60s. At first some people believed that this training was nothing but a obscurantist policy, but when they came back from the training they told their colleagues that they were really

changed in ways of logically thinking and ways of doing things. By the end of 1999, one thirds of the company employees received college education by various means, which is not a common practice for a traditional manufacturing organization.

Strategies for Company Reputation and World-Known Brand

Having achieved operational excellence, Zhang, with his modern management ideology and rich market experience, realized that premium products with supreme quality alone did not spell success in the Chinese marketplace, which would join WTO soon. A well known brand name and the company reputation would go hand in hand in the modern society for its quick communication and news media. A brand name is the part that can be vocalized for the company reputation, and the reputation, in turn, will reinforce the customer loyalty to its brand. Therefore, Zhang knew that he needed the privileged invisible asset as a springboard to achieve his ambition of global leadership. CHN & CHN[7] in Chinese and CHN & CHN[8] in English was the brand name created and nurtured for this purpose. The trademark of two Cs facing each other, represents CHN & CHN, and shapes like a plate.

When talking about the underpinning logic of his brand, Zhang commented,

> "It is wrong to think that CHN & CHN is the first brand, but China is. What perceptions do people have when they see products with Made in China on them? Poor quality, cheap and unreliable? China has not yet

[7] CHN & CHN in Chinese means China China or China ceramics, and was originated from the words of encouragement written for the company by President Zemin Jiang when he visited the organization.
[8] CHN & CHN has multiple meanings: it can sand for China China (CHN & CHN), China Chongqing, or Chongqing China, while the second China represents ceramics.

> created its image of producing products with consistent quality with established brand names. It will take many years' and great efforts of all the Chinese firms in the market to achieve a national reputation in the global market through consistency and reliability. But first of all, Chinese managers have to fully understand its significance and the relationship between building up a firm's brand name and a country reputation as a whole. What is the consequence? Right now, the average price for a piece of China is 0.87 USD for other six major manufacturers in the global marketplace, but was only 0.30 for the same Chinese products. That is the painful lesson we must learn from Japan, South Korea and Taiwan."

Marketing Strategies

Zhang's marketing strategy was "walk with two legs". On the one hand, he tried his best to conquer the domestic market with his premium products. On the other, he went all out to set up worldwide distribution channels.

Domestically, Zhang started "carpet bombardment" with public advertisements in 1995, and positioned CHN & CHN in the high-end segment of the ceramic market. In 1996, the company adopted the international practice of establishing a regional exclusive dealership system, which gave rich profits to the dealers while the company focused on management of pre-sale, in-sale and post-sale services. The promotion campaign reached its climax when the Great Hall of People ordered 250 thousand pieces of ceramic products from CHN & CHN to replace its old ones selected from seven other famous

ceramic production areas[9] in celebrating the 50th Year Anniversary of the founding of People's Republic of China. That was the highest honor that a ceramic manufacturer could ever get, and thus the competition was incredibly fierce. Some manufacturers not only offered their products for free but also would pay the cost for product promotion of selection. CHN & CHN's competitive strategy was to get the order with premium products with supreme quality for the exclusive dealer's price. In the end, CHN & CHN won the title of "China's First China" and "China's First Brand in China". Thus CHN & CHN was the first brand name to appear in The Great Hall of People, where the highest authorities of the nation are located in. The company planned an enormous ceremony when CHN & CHN China were delivered to Beijing. At the same time, a promotion campaign was engaged: Purchase a 100 *yuan* of CHN & CHN product will get 50 *yuan* of bonus to purchase other CHN & CHN products. By then, CHN & CHN was well known to most Chinese people.

In early 2000, CHN & CHN was the first in the nation to start two "Project of One Hundred Stores", the project of setting up one hundred specialty stores all over the country, and the project for establishing one hundred specialty counters in national well-known department stores, super markets and hotels. The aim of the two projects was to provide easier customer access to CHN & CHN brand name products. Within five years from 1995, CHN & CHN became undisputable "China's First China" through its achievements of first in sales volume, first in market occupation rate, first in product

[9] China eight famous ceramic famous areas are Jingdezhen, Fulin, Tangshan, Zhibuo, Handan, Hunan, and Chongqing.

design and quality and highest in average exporting price compared with other ceramic manufacturers in the country.

The two projects of "one hundred stores" is only part of the work in establishing the domestic sales system. CHN & CHN adopted the international practice in setting up its sales channel: only one exclusive sales agency in one province responsible for all the dealers within that province. These exclusive agents had a loose partnership with CHN & CHN. In those provinces where CHN & CHN had no sales, the company would go there, setting up its own agencies to develop the markets. Once the markets were cultivated and the distribution system started operating, a trustworthy exclusive agent would be found to further develop and expand this system. This was a win-win approach, which proved to be a very effective strategy in developing, cultivating and expanding markets within China. An ABC Price System was developed to help the market expansion. Exclusive agents in a province enjoyed the A Price System, which was the most favorable price among the three and took consideration of the next level of wholesale. Within those provinces where there were no exclusive agents, and the company would handle all the wholesale agents in that province, who would take B Price System. The C Price System was applicable for big department stores or supermarkets.

In 1998, 95 percent of CHN & CHN's products were sold in the domestic market. By mid 2000, the ratio between national and international sales changed to 50:50, and Zhang expected to rewrite that ratio to 30:70 at the end of 2000. Zhang planned to export 80 percent of his products to the global market in 2001. In general, sales in international markets yield more revenue, and it is especially true for premium product manufacturers.

Step by step, Zhang has been building up his global distribution network. By mid 2000, he had products sold in more than 20 countries.

In the domestic markets, Zhang adopted the family branding strategy to cover the whole group of his products. In the international market, however, he was flexible. Zhang explained that he would like to introduce his products to customers of the targeted country if the cost and time for acceptance were right. Otherwise, he would prefer to join forces with a well-known company in the local market, and use their established brand name for the market. In the US, for example, one of the major partners of CHN & CHN was Oneida[10]. Zhang said that he would be happy to be a manufacturing base for Oneida for the next couple of years. He has persuaded several other large ceramic manufacturers in the US to outsource the production function to him. Zhang's argument with them was "Why do you make your own products while I can provide the exact goods with almost half of your price?" In September 2000, CHN & CHN was undergoing Disney's two-year tough assessment process before Disney started giving the orders.

Strategies for Innovation

Zhang explained that innovation is the soul for a nation's progress and endless motivating power for a firm's development and growth. In the field of technical innovation and new product development, CHN & CHN established a Technical Center with an attempt to turn it into a national technical center for the ceramic industry. They

[10] Oneida Ltd. is the world's largest manufacturer of stainless steel and silverplated flatware for both the Consumer and Foodservice industries, and the largest supplier of dinnerware to the foodservice industry. Oneida is also a leading supplier of a variety of crystal, glassware and metal serveware for the tabletop industries.

have been pursuing this goal with two approaches. One approach was to make timely adaptations in operations strategies, such as introducing and creatively using CIMS management system and CAD design system to increase organizational management efficiency and improve the capability of new product development. The second approach was to adjust and make changes on product structure, style and pattern of product so as to meet the requirement of the ever-changing customer needs.

Evaluation of Performance

Accomplishment of Strategic and Financial Goals

By the end of 2000, CHN & CHN had achieved two of its three long-term strategic goals. The first goal, 'China's First China' was completed in 1998. The planned annual production capability of 6 million pieces of supreme ceramic houseware was surpassed, reaching 7.2 million after technology innovations. The product quality met the Rick Standard of Japan. The domestic sale for 1995 was 27.2 million *yuan*, 46.64 million *yuan* for 1996, 59.91 million *yuan* for 1997, 60.45 million *yuan* for 1998, and 61.49 million *yuan* for 1999. The sales revenue for the first six months of 2000 was 26.46 million *yuan*, which was 156.78 percent higher than that of 1995.

The second goal to become Asian's First was accomplished by the end of 1999 with annual production output of 30 million supreme ceramics with a revenue of 0.18 billion *yuan*. The premium quality satisfied the requirements of Rosenthal in Germany. The export income for 1995 was 30.26 million *yuan*, and 115 million *yuan* for 1999. The export revenue for the first six months of 2000 was 44.81 million *yuan*, which was 509

percent higher than that of 1995. It is planned that 67 percent more supreme ceramic products will added to the product arsenal in 2001.

CHN & CHN planned to become the World First with annual output of 80 million supreme ceramic housewares to satisfy the requirements of the British Royal Dulton Standard in 2005.

Management Information System

CHN & CHN's management information system has reduced the funds of purchasing after optimizing inventory levels through the use of its purchasing management system. The cash for decal papers and packing materials was reduced by 2.87 percent per month from 8.12 million *yuan* to 6.72million *yuan* and is planned to be reduced to 1.2 million *yuan* by 2002. The money for purchasing raw materials was reduced by 4.63 percent per month from 1.26 million *yuan* to 0.91 million *yuan* and is planned to be reduced to 0.6 million *yuan* by 2000. The capital needed for other materials was reduced by 5.56 percent per month from 1.5 million *yuan* to 1 million *yuan*, and was planned to be reduced to 0. 5 million *yuan* by the end of 2000. The application of the sales management system and production management system resulted in more accurate sales forecasts and production plans, thus eliminating excessive production and inventory. The carrying and handling cost of inventory has been cut by 3.1 percent per month from 11.5 million *yuan* to 9.36 million yuan, and was planned to be reduced to 8 million *yuan* by the end of 2000.

Premium Quality Product

In January 1997, CHN & CHN became the first ceramics manufacture that obtained both the ISO9001 certification and the quality certificate from Geneva SGS International Quality Institut. CHN & CHN also obtained the American FDA certificate for its healthy quality ceramic made with lead and cadmium free on-glaze technology. CHN & CHN has been recognized by the state with the highest AAA certificates for both quality satisfaction and customer satisfaction.

The ceramic formula, which is a recipe from Germany specially made for CHN & CHN, is a super white glaze free of lead and other polluted materials. Produced by high-tech hardware and software, ceramics products are "white like jade, ringing like a bell and shining like a mirror". The hardness of the glaze has reach as much as 8400MPa, highly tolerable to knives and forks. The mean time before failure is two to four times greater than ordinary tableware. Because the product design reflects the essence of stylish design drawn from both the past and the present, and from both the east and the west, thus merging both the east and west cultures and civilization, CHN & CHN ceramics have great value for collection with elegant cultural taste.

The national gifts presented to US President William Clinton of U.S., and Franch President Chirac by President Jiang Zemin and Premier Li Peng of China CHN & CHN products. The products are used by Chinese embassies of the Ministry of Foreign Affair, the Chinese National People's Congress, Northwest Airline of USA, China Diaoyutai State Guest House, and some five-star hotels. On the 50th birthday of People's Republic of China in 1999, CHN&CHN, the new product of CHN & CHN, was the only tableware

chosen for the state banquet for 5000 people. The company is the long-term supplier of THC, the greatest ceramics distributor in U.S., and CGC, the greatest producer and sales company of hang-plate of U.S.

First China Brand

CHN & CHN has been treasuring its reputation for organizational life, and has created a reputable brand name well accepted by consumers. This is the most affluent resource for the organization because reputation will bring to CHN & CHN profits for the long-term that are hard to measured in money terms. Zhang explained that not all firms that make money are successful firms, but successful firms make money. A firm succeeds because it has created its reputation in its operations, and reputation is the sustaining force to help firms with its profit. Thus Zhang believes that reputation is the foremost important competitive competence for CHN & CHN.

CHN & CHN has established its reputation in the domestic market for its well-known brand, which was demonstrated with the award of First Brand of Ceramics of China by the China Assessment Center for Famous Brand of the State Quality and Technology Control Bureau. CHN & CHN has been recognized by the state with the highest AAA certificate for brand recognition and AA certificate for brand influence. Vice Premier Bangguo Wu commented after his business visit to CHN & CHN: CHN & CHN has attained three Number Ones in its industry: "Number one in product quality; number one in exporting; number one in brand name".

Sustaining a Modern Management Model

CHN & CHN was the only firm in the ceramic industry that was approved by the State Science and Technology Ministry as a model enterprise in using CIMS by the National 863 High-tech Project. The use of CIMS enables the functional departments to timely and correctly share information for sales, production, purchasing, accounting and marketing. The Manufacturing Resource Planning II (closed-loop manufacturing system) and Enterprise Resource Planning (MRPII/ERP) systems help the organization overcome the problems of unclear responsibilities for all departments and makes the management mechanism more standardized and scientific. The integration of electronic data systems (EDS) and management information system (MIS) makes a good combination for fully utilizing "material flow", "information flow", and "capital flow". The structural data of the products, material list, technology data and basic numbers for inventories have been standardized, accurate and complete, which facilitates the sharing of information and makes a good foundation for scientific management and decisions.

The enterprise management standards have been established based on the industry standard, the national standard (GB), and the international standard (ISO). On the one hand, it standardizes the management for technology, operation and all documentary files. On the other hand, it uses the normal national and international stipulations to enable cooperation and communion between national and international enterprises. And these standards have important reference values for making relative standards for ceramics industry and national standards. The standardization and integration of functions of marketing, design, production, sales and service has greatly enhanced the

organizational capability in market responses and its distinctive competence in the global competition.

Technology Innovation

Competitive advantage lies in speed and accuracy in response to changes in demand. CHN & CHN attributed its success in large measure to the technological innovation and CIMS system it has implemented throughout the organization. IT has served as a powerful driver of process innovation. Strong performance in IT does make a real difference: better information managers are also better at core processes such as R&D, order processing, sales, and service. In turn, excellence in core processes produces tangible payoffs: solid competences in core operational processes improve profitability, and superior product development promotes growth. For example, the use of product configurators — electronic tools that simulate the putting together of a product from thousands of possible features —has made an important contribution to business success. During a sales pitch, staff is able to show customers the full range of products, variants, and types, calculate the price of the product chosen, and agree a realistic delivery date. Therefore, CHN & CHN became the national model of reorganization and reconstruction of ceramics in the Eighth-Five-Year-Plan and a high-technology enterprise of China. It has won the only first prize for the First Class New Production of National Light Industry, and the first prize of Science and Technology Progress in Chongqing.

CHAPTER VII. SICHUAN CHEMICAL WORKS (GROUP), LTD.

Sichuan Chemical Works (Group) Ltd. (SCW) is a major chemical enterprise in China, one of 18 large-scale chemical firms, and China's largest producer of ammonia, nitrogenous fertilizer, melamine and high pure argon. Its products are sold to more than 20 countries such as USA, Japan, Russia, Germany, Korea, and Indonesia. SCW holds stock in 14 companies, and has a strategic relationship with 50 firms in China. In 2000, the company had 15,000 staff and workers with total assets of 1.5 billion RMB. The company has been in the list of "500 largest industrial enterprises in China" for around 10 years.

Industry Competitive Situation Analysis

Chemicals are an important component of China's drive to modernize industrial production. In 1997, petrochemical revenues were $73 billion USD. Even while domestic demand has sustained sales volumes, China has had to cope with the two-pronged effects of the Asian financial crisis, namely decreased demand as export growth has slowed, and new supplies of low priced Asian imports.

In 1998, China imported $4.45 billion USD in inorganic and organic chemicals, $465 million of which was imported from the US. Although the government is eager to attract foreign investment, they are skittish about giving away too much of the domestic market. As an example, in 1997, China's ethylene output reached 3.58 million tons,

which only met around half of the domestic demand. However due to heavy losses racked up by many of Sinopec's affiliates in 1998, Sinopec decided to postpone all five of the multibillion-dollar petrochemical joint ventures it had been planning with Western partners to produce ethylene. In East China this new policy affected projects with BASF, BP Amoco, and Phillips.

China mirrors the world market in that the inorganic and organic chemicals face areas of both oversupply and under-supply. Inorganic chemicals such as caustic soda and soda ash are greatly oversupplied whereas ethylene, propylene, butadiene, and styrene are under-supplied.

The pace of change in the chemicals industry, however, is slow. Despite a wave of mergers and acquisitions, the same companies have held the top ranks for well over a decade. And looking ahead, the traditional growth strategies of chemical companies are running out of steam. Unless they find a new direction, they will preside over ever-diminishing growth prospects that will prompt investors to abandon the sector.

Over the next decade, traditional asset-based strategies will still be an important source of profit, but chemical companies will also need to create other such sources to growth. Knowledge-based strategies will provide that new growth.

The industry today includes three main kinds of companies: commodity players that produce basic chemicals and plastics, specialty players that formulate chemicals to meet specific customer requirements, and hybrids that have interests in many kinds of business along the length of the value chain.

What is remarkable is how few new entrants the industry has attracted compared with other sectors and how little impact the Internet and the new economy have had on the incumbents. Essentially, the chemicals industry lacks "shapers": companies that have generated new profits by transforming the way they do business. Chemicals companies still rely on traditional strategies for growth. For the past three decades, chemicals companies have been trying to extract additional value from their assets. In the 1970s and 1980s, that meant a focus on functions such as sales and operations. In the 1990s, consolidation and restructuring were the name of the game. The former was primarily to reap economies of scale and capture synergies, the latter, primarily to realize cost savings.

Until the Asian crisis hit in 1997, these strategies served many companies well. The overall sector's performance was in line with the total stock markets, and companies in Europe and North America, where most of the consolidation and restructuring took place, often performed better than their counterparts in other basic-materials industries such as steel and paper. But the Asian crisis wiped out some $25 billion USD worth of annual economic profit, and confidence in the sector fell. Share prices haven't recovered, because investors are still skeptical about the industry's growth prospects.

It would be wrong to conclude that asset-based strategies no longer offer any potential for growth. Such strategies could clearly help Asian companies—many of which have been losing money—that have yet to begin serious consolidation or restructuring. Indeed, analysts believe that these approaches could generate up to $60 billion a year in additional earnings. In North America and Europe, where companies

have responded more swiftly to the performance demands of the capital markets, the potential for further cost cutting is limited and further consolidation in many product segments would raise antitrust concerns. In any event, share prices have already taken into account expected increases in operational performance.

Strategic herding has become the problem (Nattermann, 2000). A strategy that has worked for one business is commonly adopted by its competitors, making it difficult for customers to differentiate among these companies. Industry-wide cost reduction efforts lead all competitors to offer lower prices, damaging the whole industry. Of course, chemicals companies can't ignore cost reduction efforts: they have to be made if a company is to remain competitive. But in the future, cost cutting will not be a significant driver of value creation for shareholders. The main source of value creation in asset-based strategies will be the kind of restructuring that focuses the activities of a company more narrowly in areas where it is truly distinctive. Many hybrids are finding that they have captured all the synergies available from their different businesses. Consequently, a few are starting to focus on businesses in which they already have a leading position. Their strategy is to divest weaker businesses and to buy up assets in their core one, hoping to strengthen their operations and capture still more economies of scale (Bryan, L. L., & Fraser, J. N., 1999; Crawford, Johnsen, Robb, & Sidebottom, 1999). The potential is huge, since hybrids dominate the industry, but the savings are still finite and will not likely boost profits for more than five to ten years.

Company Profile

Sichuan Chemical Works (Group) Ltd. (SCW), located in western Sichuan Plain was established in 1956. During the last 44 years, SCW has given birth to the first China-made medium-scale nitrogenous fertilizer plant (1959), the first imported large-scale fertilizer plant in China (1976), the first imported large-scale melamine plant in China (1984), the first China-made large-scale ammonia plant in China (1990). In 1992 SCW annexed Chendu Wangjiang Chemical Corporation. The year 1994 saw the organization and establishment of the SCW Group.

The first large-scale joint-venture lysine plant opened in1996. SCW was restructured into a limited liability company with the merge of Shifang Chuanxi Phosphorous Chemical Group Company.

Sichuan Chemical Works (Group) Ltd. is a state-owned corporation with 22 departments engaging in production, management, R&D, and a holding company of nine subsidiaries. SCW holds stock in 14 companies, and has a strategic relationship with 50 firms in China. Currently the company has 15,000 staff and workers with total assets of 1.5 billion RMB.

With its comprehensive troops of professional and advanced technical facilities, SCW's business range covers chemical production, scientific research and development, chemical engineering, anti-corrosion and design, manufacture, inspection of pressure vessels, construction and erection, real estate development, road transportation, and technical support.

SCW is a super-large chemical enterprise in China, one of the 18 large-scale chemical production bases, the largest enterprise presently in China producing ammonia, nitrogenous fertilizer, melamine and high pure argon. SCW manufactures more than 90 varieties of products in more than 200 specifications, with a capacity of 500,000 tons of ammonia, 620,000 tons of urea, 240,000 tons of ammonium nitrate, 15,000 tons of concentrated nitric acid, 100,000 tons of sulphuric acid, 12,000 tons of melamine, 2,500 tons of catalyst, 1.8 million cubic meters of argon per year, 8,000 tons of leather chemicals, 4,500 tons of amino-plastics and 100,000 tons of phosphorous chemicals. The dominant products are made in line with international standards or advanced standards in the world for preparations into WTO in the near future. High-quality value products meeting or exceeding national and provincial requirements account for 87 percent of the total annual output.

SCW enjoys the authorization of import and export. Its products are sold well to more than 20 countries such as USA, Japan, Russia, Germany, Korea, Indonesia, etc. The company has been in the list of "500 largest industrial enterprises in China" for approximately 10 years.

Strategic Challenges

Management Challenge

When talking China Economic Weekly journalists on March 3, 1998, Muxi Xie, the CEO of SCW pointed out, "In the ever increasing market competition today, the external constraining factors are, of course, significant considerations in the firm's decision

making, but for organization itself, appropriate management is the most crucial and decisive determination for the firm's performance."

Throughout 1960s and 1970s, the major management approach for SCW was organized control of manufacturing processes, with the management goal of "safety and stabilized operation" of its chemical industrial facilities. In other words, the management model was production management with emphasis on "safety".

In the 1980s, new changes took place both in SCW's external and internal environments. In the external environment, the state adopted a policy of a "planned commodity economy", which started the transformation from central planned economy to market economy. All of SCW's products, except fertilizer, were put into the market and joined the competition. Competition was a new concept for most of the Chinese state-owned enterprises, especially the large ones. Under such circumstances, SCW introduced "total quality management", and started an "internal economic responsibility system". Based upon the management philosophy of "high work quality, long operation cycle, low energy consumption and good value products", SCW shifted its manufacturing management approach to both manufacturing and service models with emphasis not only on safety but also on quality.

Entering into early 1990s, SCW faced more challenges and threats from market competition. Several factors caused the historically high profitability of SCW to become very thing profits. These factors included a shortage of natural gas--the primary raw material for SCW, and its continual price increase, government regulations of the price and sales for chemical fertilizer-- the backbone products of SCW, the heavy burden of

accumulated debts, and the deficiency and aging of some production facilities. There are 22 dependent subsidiary firms in SCW, among which five companies were rated as Grade A large companies. There were continuing debates as to whether these firms should be authorized to manage their own operations during China's transition from a planned economy to a market economy. SCW had difficulty in making transition. " Once centralized, these firms became very rigid and lost their vitality, but became chaotic when given full autonomy in management" because these firms had been working in central planning environment for 40 years and were not ready for independent operations, especially with both national and international environments changing rapidly and dynamically. CEO, Muxi Xie and his management team realized that its manufacturing management approach of operation with emphasis on safety and quality could no longer meet the requirement of the new market economy. Thus in 1993, a new model of risk responsibility and goal management was put forward for discussion and put into practice in 1994. This model won second prize in the Fourth National Innovation for Enterprise Management Modernization in 1997.

Entering into 1997, SCW found the dynamic environment and swift changing economic situation required large-scale operations to achieve economies of scope and economies of scale. The business model of risk responsibility and goal management was no longer effective and the major weakness was its ineffective coordination capacity among functional departments and subsidiary firms.

Production Safety

SCW is one of China's 500 biggest industrial enterprises. Safety management and control is one of the major concerns for this extra large chemical manufacturer. This is especially true when the organization started to adopt the manufacturing goal of "Maximum Profit" in 1995 when competition was introduced into the Chinese chemical market. The firm entered an ever increasing dangerous and threatening man-made environment with its high pressure and high temperature production facilities, and highly flammable and explosive materials, which are poisonous, erosive, and suffocating. Only through improving safety management could the firm fulfill its social responsibilities and meet the demands of the market economy.

Product Structure

In general, the product structure of SCW was not satisfactory: chemical fertilizers accounted for 65 percent of all the products. Even though this focused strategy worked fine in the Sichuan Province, it seriously confined SCW in its competition capability in the national market and the global market. SCW needed to provide wider lines of products.

Threats from Upstream Suppliers

SCW relied heavily on the raw materials from the upstream suppliers. For example, one-cent increase for raw material gas could wipe out eight million dollars profit from SCW's income statement. The cost of water and electricity was so great that the

organization could not stand if some emergency measures were not taken. However, the prices for the major products of SCW were controlled by the government.

Strategic Responses

Risk Responsibility and Goal Management

Risk responsibility and goal management is a management system that focuses on three critical factors influencing the economic and social efficiency of the enterprise: cost, quality and safety. With market demand as a guiding principle, the system adopted theory and practice of goal management through analyzing and decomposing responsibilities for each level of management, and contracting the corresponding responsibility and authority to every level of managers.

In SCW, the internal management for all the subsidiary firms was centered on goal setting, and the resources such as manpower, capital, raw materials, energy and facilities are allocated based upon the priority of the planned goals. The major aim of this management approach is to achieve what the organization is for, the profit through low cost, high quality and safe operations. Low cost and high quality made it possible for the firm to use the brand name strategy, increase market share in both domestic and international markets, and enhance the firm reputation globally. Only through safety management could the organization minimize disastrous incidents to ensure the continuous operation and long cycle of stability.

SCW made it very clear at the beginning to all the employees that the success of the organization depended on three decisive factors of cost, quality and safety, and these

factors relied on employees' loyalty and commitment. Risk responsibility and goal management was the continuation and creation of the firm's motto of "creating superior reputation and establishing civilized organizational culture" and the organizational spirit of "solidarity, self-improving, hardship and innovation". This management approach covered four areas: simulation of market costs, internal financial accounting, assessment of goal accomplishment, and evaluation of cost, quality and safety.

Simulating of Market Cost.

Simulation was used to introduce the market price system into the transactions among all the departments of SCW. The cost of all the products were calculated using the market price as index for materials bought from the market, materials or semi-products from exchange, labor, electricity and all other direct and indirect cost of the product. This method was particular important for employees who had worked all their life under the central planned system and had no idea of market competition. Detailed calculation and simulated market environments helped the employees understand what was going on in the marketplace. The most important thing was that all the employees in the company came to realize how significant cost saving was to the company profit and survival. Ever since the simulation of market costs, employees worked hard to cut costs in labor, materials, and especially in major maintenance. The company achieved 10 percent less expenses for four years running, and saved as much as 40 million RMB during that period.

Establishing Internal Banking Accounts.

The major purpose of establishing internal banking account for each functional department was to set up a company price system, which is similar as the cost centers in the western management. This approach was a simulation of the market operation system. Transactions among departments inside the organization were dealt with as those among firms in the marketplace. Compensation and rewards were made much easier and employees were highly motivated to exert their best in both cost savings and departmental growth, because they knew that if they worked towards the department interest, and that would bring them more income, too.

Assessing Goal Responsibility.

The total goal of the organization was decomposed into detailed departmental goals, which formed the goal system for the firm. When interviewed by Sichuan Workers' Daily in 1998, CEO Xie explained that this approach aimed at setting up a complete responsibility goal system, and assessing performance for each level determined the pay for employees in each functional department. Every month, 40 *yuan* was retained as responsibility deposit from the employees' pay, and if the planned goal was not completed for the next month, the employees not only got no bonus pay for the month, but also lost the responsibility deposit.

Three Repudiations.

The amount of employees' pay was based upon three factors of cost, quality and safety, which had a crucial impact on firm's profit and reputation. Deviation from any of them resulted in repudiations of pay level. In the interview with Sichuan Workers' Daily,

Mr. Xie emphasized that in SCW any one of the three factors, cost, quality and safety are premised on the other two. Any deviation from any one of the three factors would influence the other two, leading to poor performance of the firm.

Six Steps of Implementation

Step One: Creation and decomposition of responsibility goal

Based upon enterprise long-term planning and internal and external situations, SCW set up goal expectation system for various functional units, and established standards for assessments, and thus formed the chain systems for goal management in cost, quality and safety.

Step Two: Establishing assessment standards for internal economic responsibility goal

SCW established six categories of economic responsibility systems on the basis of characteristics of the functional departments and subsidiary firms to carry out the principle of "Profitability decides reward distribution".

Step Three: Establishing responsibility accounting system

A responsibility accounting system was established to help the functional units with their booking keeping and management, and performance pay was calculated based on the accomplishment of target responsibility goal.

Step Four: Establishing internal banking system

Marketing exchange relationships were established among the functional units in their economic transactions. This was a breakthrough in the former central planning socialist

system because each unit had to take care of their own cash inflows, outflows, loans, and other financing business.

Step Five: Establishing internal price index

The internal price system was set up in accordance with the current market price, and adjustment was made every half a year to keep on track of the market fluctuation.

Step Six: Assessment of performance

Detail evaluation procedures were laid out for economic contracts with functional units. This was why the management approach can be persistently carried out and successfully improved over time. The following three principles were adopted in the assessment of performance.

Principle of Distribution in Accordance with Performance and Work Contribution.

Money bonus was the firm's appreciation for its employees' hard work and extra contribution. The performance assessment system was strictly reinforced to overcome the bad habit derived from the central-planned economic system in which you "Get your salary when you come to work and get bonus when you work".

Principle of Risk Sharing.

In order to stimulate and reinforce motivation mechanism and overcome the internal "iron bowl" phenomenon[11], part of the employees' pay was withheld for risk sharing money. The risk sharing money and bonus were put together and termed

[11] The expression commonly used in China referring to equal pay without considering performance and contribution under the central-planned economic system.

"Performance Pay", which was not fixed and decided by employees' contributions in work.

Principle of Three Repudiations.

The performance would be repudiated and performance pay would not be given for any work unit that did not achieve the targeted index in the contract for cost and profit, that did not meet the quality requirements for their work and products, and/or that suffered with significant accident or death owing to safety negligence. The following two equations were used for monthly pay.

$$W_1 = C\ Q\ S\ (PP + CP) - N \qquad (1)$$

$$W_2 = C\ Q\ S\ [20\ (URI) + 20\ (RSI) + UPI\ (CAP) - N$$

W_1: Performance pay for manufacturing employees for chemical products;
W_2: Performance pay for administrative employees;
C: Cost repudiation index;
Q: Quality repudiation index;
S: Safety repudiation index;
PP: Pay of production yield;
CP: Pay for cost savings;
URI: Unit responsibility index;
RSI: Risk sharing index;
UPI: Unit performance index;
CAP: Average bonus for chemical production employees;
N: Total deduction from three repudiations.

Safety Management

The successful practice of safety management of SCW resulted from the application of total quality management (TQM) and total safety control (TSC). The philosophy of TSC was that safety comes first; prevention comes first; hard data speaks

louder; and safety control involves the participation of all employees in every aspect during the entire internal value chain process for 24 hours in the whole year.

Safety Training and Education

The Safety and Technology Department in SCW, consisting of 70 well trained and experienced talents, timely collected and processed safety information, and compiled a textbook as needed for training. Since 1986, the department ran six training classes in the nation, 11 in the province and 721 in SCW. More than 30,000 people in the organization were trained.

In the recent years, the teaching methodology has included not only the traditional class lecturing but also various activities that educate people through arts, literature, exhibitions, calligraphy, TV safety knowledge contest, dancing, cross talk and so on. These activities produced better results. After years of persistent and hard efforts, employees have made the mental transition from "I am required to work safely" to "I need safety" and "I am doing my best to operate safely".

Safety Network Based on Production Responsibility System

Three layers of safety hierarchy were developed after years of practice and experience. The decision layer, which was made of top management team of the SCW, union chairman and heads of functional departments, was responsible for coordinating among departments and subsidiaries, and making decisions concerning major safety production. The management layer consisted of functional departments, and carried on comprehensive management. The supervisors of workshops and manufacturing teams functioned as the executing layer. They were not only responsible for the production but

also for the entire process of safety in daily operations. SCW had 124 safety inspectors equipped with the best facilities among all the professional safety and technology teams in the industry.

Documentation of Specific Safety Responsibilities

The safety responsibility system is the guarantee of the chemical production system, and is the guiding rules for employee behavior in the process of chemical manufacturing process. For various departments and workshops, there were 36 safety management systems, 46 safety technical procedures, 400 commonly used safety information indexes, and more than 100 management forms, cards and pamphlets. Seventeen safety systems were upgraded to enterprise standards to avoid unclear responsibilities that resulted in pointing fingers.

Scientific Assessment System

One of the most difficult tasks in the safety responsibility system development was the setting up of effective and efficient assessment system. The Contracted Risk Responsibility System consisting of "risk responsibility and goal management, Simulating of Market Cost, establishing internal banking account, Assessing Goal Responsibility, and Three Repudiations" has proven to be an excellent scientific assessment management system. This management approach received a Second Prize for National Enterprise Management Innovation, and First Enterprise Management Prize from the Ministry of Chemical Industry. The system safety management implementation process was well explained in Figure 11. Every production unit was required to hand in their written safety information to the Safety and Technology

Department, which made the assessment and assigned grade before performance payment was given. The grading was made in accordance with 17 evaluation sections.

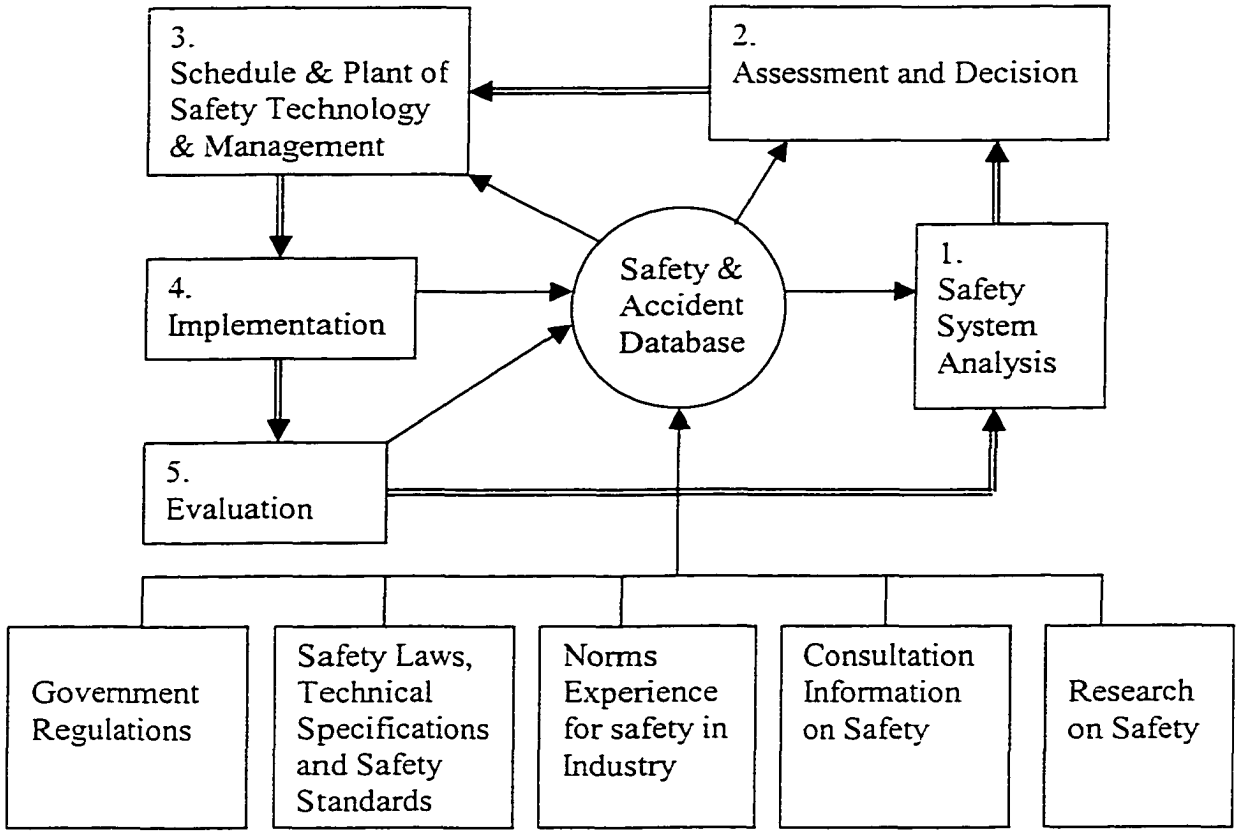


Figure 11. Systematic Safety Management implementation process

Strategies for Expansion

Development of Compound Fertilizer

CEO Xie realized that the company could not withstand the impact of market risk without diversification. He put emphasis on related diversification of his products to adapt to ecologic agriculture in China. He started a joint venture with Norway in 1999, which has the annual production capacity of making 0.5 million tons of compounded fertilizer of nitrogen, phosphorous, and potassium. This is a premium product that is far

more superior to similar products in the domestic market. This product has a very bright future because it cannot only help increase the yield in agriculture, but also protect the environment. The expected return on investment was estimated at 13 percent.

Sulphuric Aid Potassium

The factory with annual production capacity of 20 thousand tons of sulphuric acid potassium invested by SCW and Qingsang Corporation from Taiwan started production in 1999. And the factory got 2 million yuan profit on the same year of production. At the end of 1999, the production capacity was doubled, with plans to double it again in 2000. SCW's existing products of ammonium nitrate and urea were raw materials for the compounded fertilizer of sulphuric acid potassium. This compound has a protective effect on the environment.

Melamine

Another new production facility made 15 thousand tons of melamine, added to the existing 12 thousand tons of capacity. This expansion helped SCW to gain the leadership position of the niche market for supplying this multi-functional material. The production yield for melamine accounted for 40 percent of the total production capacity for SCW with sales of 0.7 billion yuan.

Biochemistry

An important action taken by SCW was the diversification into biochemistry, which was in need by the economic agriculture. The successful operation resulted from a joint venture with Japan with annual capacity of 10 thousand tons of lysine. After the

technical modification in 1999, the production yields increased by three thousand tons. The production capacity would be increased to 20 thousand tons in the year of 2002.

Fine and Specialty Chemistry

SCW continues research and development on fine and specialty chemical products. Xie, the CEO, explained that the fine and specialty chemical products were a development priority for China's chemical industry. Fine and specialty chemicals are value-added performance chemicals with many varieties. They are hi-tech in nature, very efficient, and have a wide variety of applications. These chemicals are used in various industry sectors such as agriculture, textile, health care, electronics, food and feed, medicine, household and industrial cleaning, automotive, paper, plastics and rubber, and other industries. China started to develop this industry in the 1980s. Presently, China has 10 fine and specialty chemical technology development centers, with over 3,800 companies manufacturing more than 9,200 kinds of fine and specialty chemicals with an annual output of around 8.7 million tons. This output presently only accounted for 35 percent of gross chemical output. In developed countries, the ratio was up to 55-65 percent.

Domestically produced fine and specialty chemicals cannot satisfy China's rapidly growing market because domestic manufacturers had quality problems and lacked the same product variety as foreign manufacturers. As a result, China needed to import many types of fine and specialty chemicals to meet the increasing market demand for high quality and high technology chemicals. Because of this, the Chinese central government and local governments issued a series of preferential policies, such as tariff reductions and investment incentives to encourage foreign investment in the chemical industry to

manufacture products in China. Furthermore, the Chinese government placed emphasis on patent protection and environmental problems, which resulted in new laws and regulations, and enforcement of technology patents and environmental protection.

A few big U.S. firms have good reputations for their products and have invested in China with joint ventures to expand sales. However, American firms face stiff competition from Germany, Britain, France, Italy, and Japan.

In the early 1980's, China introduced large-scale petrochemical facilities and began to develop the fine and specialty chemical industry. As China's industries rapidly developed, the demand for fine and specialty chemicals rose. CEO Xie explained that the development of the fine and specialty chemical industry has been restricted by the shortage of applied research, technical services, high technologies, funds, and market exploitation. On September 8, 2000, SCW planned to issue 13,000 shares of stocks in the Chinese Stock Market, which was strictly controlled by the government. Part of the investment would be used to develop fine and specialty chemical products to improve the product variety and quality to meet the market demand. It was planned that the fine and specialty chemical products would reach as much as 20 percentage in SCW's total product structure.

Evaluation of Performance

Drastic Improvement in Enterprise Comprehensive Management

CEO Xie commented: "Enterprise management involves every aspect of activities in the company, including people, finance, assets, manufacturing, marketing, etc. It is

extremely significant to appropriately handle the relationship among risk, responsibility and benefits for our employees. That is why SCW employed the Risk Responsibility Goal Management Approach to mechanically merge the three together, which overcomes the motivations problems derived from the central-controlled economy. This approach has put the major management factors in a nice scientific order, and greatly enhance the comprehensive management level."

Improvement of Basic Management

In order to implement the Risk Responsibility and Goal Management Approach, SCW put emphasis on team building and work floor management apart from management standardization, information sharing, and employee education. The company has run 17 training classes for team supervisors, and all the supervisors in the firm have been trained. Three hundred and fifty-five outstanding safety production teams have been awarded.

Improvement of Work Floor Management

The work floor management centers regulated disciplines for both technological operations and labor, preventing facilities from any incidents such as leaking of dangerous liquid or gas, and keeping a hygienic production environment. The firm has awards from both the Chemical Ministry and the province for its safety and civilization development.

Improvement of Technical Management

Risk Responsibility Goal Management Approach has resulted in a steady decrease in total production costs since it was implemented, which helped SCW gain the leadership

position in the industry for product quality and management. The premium products accounted for 87 percent of the total output. Urea and melamine have maintained their famous brand reputation in the country. Great achievement has been made in safety production with total incident rate below 0.15 percent, which is much lower than the industry standard of 0.30 percent. Within the last 10 year, no fatal incident had occurred. Detailed technical achievements were shown in Table 11.

Drastic Improvement in Financial Goals

CEO Xie pointed out "In essence, the aim to reinforce management is to do a better exchange job with input for output. A better result of exchange is a good illustration of better management. Since the implementation of the Risk Responsibility Goal Management Approach, the enterprise's economic profits have increase so much that major economic indexes have reached historical heights."

Table 11 .Important Technical Achievement

Year	Item	Cooperators	Award
1978	Triple tube internal of NH3 converter	Qinghua University	Award from National Conference of Science
1978	NH3 synthesis catalyst Type A9	Research Institute of Nanjing Chemical Corporation	Award from National Conference of Science
1978	Perforated tray with non-homogeneous opening rate for copper liquid scrubbing column	Chengdu University of Science and Technology	Award from National Conference of Science
1978	Modified A. D. A. de-sulphuration process		Award from National Conference of Science
1978	CO_2 removal process of DETA catalyzed K_2CO_3 solution	Sichuan University	Award from National Conference of Science
1978	Intermittently catalytic reforming of natural gas	Chemical Research Institute	Award from National Conference of Science
1985	Treatment of NO_x in HNO_3, tail gas by selective catalytic production process with NH_3	Chengdu University of Science and Technology	National Third Prize for Technical Innovation
1985	Technical innovation of an imported large-scale fertilizer plant		National Third Prize for Technical Innovation
1986	Solid ammonium sulphite from treatment of SO_2 in sulphuric acid tail gas		Second prize from Technical Innovation from Ministry of Chemical Industry
1987	Primary reforming catalyst Z109-1 Y, Z109-2Y	Chengdu Research Institute of Organic Chemical of Science Institute; Chengdu 715 Factory	National Second Prize for technical innovation; First prize for technical innovation from Sichuan Province
1987	Computer controlled large-size NH_3 plant	Shanghai Chemical Research Institute: Nanjing Chemical Research Institute	First prize for technical innovation from Ministry of Chemical Industry: National third prize for technical innovation
1989	Modification of the melamine plant stripper with triphase perforated tray by SCW		First prize for technical innovation from Sichuan Province: National third prize for technical innovation
1990	Computer control system for fertilizer manufacturing	Eastern China Chemical Institute: Shanghai Chemical Research Institute	Second prize from Technical Innovation from Ministry of Chemical Industry; National third prize for technical innovation
1992	China-made 200,000 tons of Ammonia Plant	13 cooperators including CCECC	Special prize from Technical Innovation from Ministry of Chemical Industry; National first prize for technical innovation
1992	A technical revamping project for energy-saving and production of the outmoded ammonia plant		Second prize for technical innovation from Sichuan Province
1995	Porous granular ammonium nitrate		Second prize for technical innovation from Sichuan Province

CHAPTER VIII. JINGWEI TEXTITLE MACHINERY CO. LTD.

Jingwei Textile Machinery Company Ltd (Jingwei) operates in the textile machinery sector. Jingwei is one of the largest textile machinery manufacturers in China. It produces a wide array of textile machinery products, which can be classified under 3 categories, natural fiber textile machinery, chemical fiber textile machinery, and components, and special parts for textile machinery.

This analysis compares Jingwei with three other user selected companies: Shanghai Erfangji Textile Machinery Co. (1999 sales of 291.04 million Chinese Renmimbi [$35.16 million USD]), Lakshimi Machine Works Limited of India (2000 sales: 4.31 billion Indian Rupees [$92.58 million USD] of which 46 percent was Spinning preparatory machinery), and China Textile Machinery Stock Ltd. (1999 sales of 276.89 million Chinese Renmimbi [$33.45 million USD]).

Industry Competitive Situation Analysis

The vigorous development of China's industry in recent years brought a continually increasing demand for machine tools. According to a China Machine Tool & Tool Builders' Association report, during the 8th five-year plan period (1990-1995) the import of machine tools steadily increased to $2.2 billion USD in 1995. In 1996 the import value reached the record breaking level of $2.52 billion USD. This surge was driven by the belief that the Chinese Government would announce a cancellation of the tariff exemption on imported capital equipment at the end of the year. This indeed did occur.

The import of machine tools in 1997 dropped down to $1.58 billion USD. Starting from January 1, 1998, the Chinese Government resumed tariff incentives and preferential treatment on imports of high technology and machine tools for foreign-funded projects. China imported 688 million USD worth of machine tools in the first six months of 1998, up 9.77 percent from a year earlier.

There has been a rapid increase in the demand for NC (numerical controls), and high-efficiency & precision machine tools of medium, medium-high, and high grades. According to a China Machine Tool & Tool Builders' Association report, the consumption rate of machine tools and the market share of NC and high-efficiency precision machine tools have increased from 6 percent to 30 percent of all machine tools from 1990-1996. Domestic production of similar grade machine tools has been insufficient to meet market demand, and, as a result, imports of foreign manufactured machine tools have increased dramatically during the past few years.

Company Profile

Historical Perspective

Most of the big state-owned enterprises in China, especially those with strong production capability and technical competence, were built in 50s. The national economy from 50s to 1980s was dominated by central planning, which was learned from the Soviet Union. China established its basic industries such as mechanical industry, electronic industry, shipbuilding industry, light industry, and textile industry. The distribution system was socialist, i.e. equal pay. In general, in a poor and backward country such as China in

1950s to 1970s, the national economic goal was to provide employment to everyone with production capability. In emerging basic industries, there was shortage of supply, and thus anything produced could be sold quickly. There was no idea of competition in the marketplace. Over the forty years, the SOEs have developed into small societies, from kindergarten to hospital, heavily involved in social responsibilities. During the last 20 years of reform, a lot of such problems have been solved, but some critical issues still remain, thus forming the challenges of efficiency and effectiveness for firms such as Jingwei.

Strategic Challenges

Challenge of Technology Innovation

The biggest challenge for Jingwei in the market economy is technology innovation. It is troubled by insufficient motivation and lack of technological innovation. With the global economic situation constantly changing, technologic innovation is a driving force. Jingwei was facing the challenge of global competition, especially when China joins the WTO and terminates all the protections and tariff barrier. Can Jingwei survive with open competition with domestic and foreign players?

The normal practice in Jingwei was to buy the most advanced products or technology, if possible, and learn from them. Frequently, Jingwei purchased the blue print and the patent, and spent several years digesting the new technology and turning it into commercial products. When the products hit the market, they were no longer advanced, and hopefully not obsolete. The company was constantly playing catch-up.

Challenge of Compensation

One of the major reasons leading to the lack of motivation in technology innovation in SOEs is that all the employees including the managers have not been paid for what they have contributed. Even though various approaches have been attempted, the problem still remains. Global competition affects products, technology, quality, production costs, and marketing strategies. However, another look reveals that global competition is about human talents. Without an appropriate compensation system, there will be no motivated workforce, and without energizing people, there is no way to withstand the global pressure.

In technology, it is hard for Jingwei to take a leadership role because the company cannot guarantee a better quality of life. Since there is little difference in pay no matter whether people perform well or not, there are very few technical people focusing on their job. In a market driven society, competent people can buy a house of their own and have a car for convenience. Therefore, people choose jobs that can bring them more income to satisfy the material needs.

Challenge of High Turnover

It is difficult for Jingwei to keep junior technicians. Jingwei has become the employee resource for joint ventures, and private and foreign owned companies. Two or three years after graduation, employees have been well trained in the production process, and become most productive. Headhunters offering much higher pay attract them away. Shitong Chen, the CEO of Jingwei illustrated this point with his personal experience.

"My son, who graduated from a university, majoring in computers, went to work for a foreign owned company. His monthly salary was higher than mine. I have been working for so long, and managing such a large company, which has been very successful. However, I was paid less than new college graduates. On the other hand, if I need people such as my son, I have no way to afford to attract him here."

CEO Chen explained that the distribution system and working conditions for SEOs such as Jingwei are poor at attracting and keeping human talents, resulting in a high turnover rate. This is understandable because these people hope to have bigger living areas with better living conditions, and they want to have their own cars.

This is a major problem for SOEs that cannot pay for the employees' contribution worth and satisfy the minimum living requirements in the modern society. "The government knows it and we, the executives of SOEs, know it, but it is just hard for us to solve it under the present conditions, which is an accumulation and legacy of the central controlled system of the past 50 years." The needed social infrastructure was lacking. There is chaos in an organization when suddenly a very few people get paid ten or twenty times more than the majority of the employees in the company who have deep rooted feelings about equality in pay from the traditional system.

Challenge of Employee Quality

CEO Chen argues that labor costs are not low in China. He explained that people cannot only look at the individual pay rate and jump to a conclusion that the labor cost is favorable. In fact, in SOEs, several people are doing the job that one man can handle,

and the skills of these people are pretty low. He compared the textile machinery manufacturers in Taiwan he visited in July 2000 with the counterparts in China. The maximum number in those factories in Taiwan is less than 200, while there are several thousand in the mainland firms. People in Taiwan firms master the core technology and assembly secrets, and outsource other factory jobs. They have much higher profits.

Strategic Responses

Jingwei Contemporary Integrated Manufacturing System (JW-CIMS)

The aim of establishing JW-CIMS was to improve the competitiveness of the organization by information integration, process re-engineering and optimization, and agile manufacturing (enterprise integration). This system requires huge investments. The 10 years before 1996, Jingwei invested 15 million yuan into its research and application. In 1996, Jingwei had attained the operating scale and company size required by the government to issue stocks to the public. The 10 million yuan of equity was used for development and modifications for JW-CIMS subsystems.

JW-CIMS consists of four systems: manufacturing automation system (MAS), computer-aided quality system (CAQ), management information system (MIS), as well as computer-aided design (CAD), computer-aided process planning (CAPP), and computer-aided manufacturing (CAM). A team of about 100 was working on the development and application of CIMS. In 2000, Jingwei had 3 super small machines, 70 CAD work stations, 250 peripheral PCs, and 100 graphic printing machines, which constitute the information network covering all the systems, departments for various

products and businesses. With the support of the data system, great work has been done in enterprise management, product development, technology innovation, product manufacturing, sales and marketing, etc.

Engineering Design System

Since 1990, GT-CAD was used to establish a data bank for categories of parts for old products, and to provide support for improvement modifications. Two-dimension and three-dimension technology was used for new product design and development. Optimization technology was used for designing crucial parts, and enhanced the product standardization and serial level. In 1996, a project of designing without drafting boards was completed and all new products could be designed through the engineering design system. Since then many new application methods have been developed for CAPP and CAM systems to effectively improve the engineering design technology. The integration of CAD/CAPP/CAM based on STEP standard and Project of Designing without Drafting Boards provided the enterprise with new tools and technology, which greatly shortened the product research and development cycle and greatly reduced the cost both for labor and equipment for engineering design.

Manufacturing Automation System

Computer Numerical Control (CNC) and Flexible Automation System (FAS) have been the focus of investment in recent years for Jingwei, and 90 million yuan was spent on computer numerical machines, production center, and flexible production lines. In 1999, computer numerical control machines accounted for more than 30 percent of all the fixed assets of all the machines in Jingwei, and CNC technology upgraded and greatly

enhanced the manufacturing capability and provided a solid foundation for new product development and product quality. Two FAS lines were integrated through networks and MIS, using CAD/CAPP/CAM. In 1997, a large-scale flexible production workshop was set up, and Jingwei was equipped with the capability to develop and manufacture new and high-tech products.

Quality Control System (QCS)

The system worked together with enterprise MIS to collect and analyze information concerning the quantity and quality of all materials in the firm. The automatic follow-up and control were performed by QCS for their quality control. The major functions of QCS are the planning of quality and scheduling of quality index, and evaluation and assessment. QCS is also used to implement the ISO9000 standards and evaluate the work results. It is employed in analysis of quality cost control, and quality test for product modification with QFD methodology. QCS has done a wonderful job in improving product quality and quality management.

Enterprise Management System

Enterprise Management System is a modified system from Manufacturing Resource Planning II (MRP II), a closed-loop manufacturing system. The Enterprise Management System covers all the strategic functional units, such as marketing, material procurement, production planning, manufacturing control, inventory management, accounting and finance, equipment management, HRM, and office automation. It is an advanced and effective management information system, which integrates the material flow, information flow, and value flow. The entire operational process of over 98

percent of the firm's sales has been integrated, resulting in improvement of production scheduling efficiency, much shorter production cycle of major products, and timely and accurate response of the firm to customer demand, enhance capability of the firm to adapt to the change of the market as well as improved capital utilization and inventory management.

Competent Top Management Team

In the past 10 year, explained CEO Chen, Jingwei has paid special attention to the training and development of its top management team. They all understand that TMT is the central nervous system of the organization. Having analyzed the real situations, both internally and externally, the top management team made several decisions, which proved crucial to Jingwei's long-term success.

Accumulating Capital from the Stock Market

The usual practice of large Chinese firms in financing their operations has been using their leverage—to borrow money from banks. Many firms got into this malignant cycle, and suffered from the heavy debt. The top management team realized this trap, and decided to establish a new road for the organization. In the late 1980s, Jingwei started to prepare for the future stock strategy. In China, not many firms dared to take actions to get into the stock market because the government had strict regulations and very high requirements for firms' performance and size. After about 10 years of hard work and preparations, Jingwei succeeded in issuing stocks to the public in 1996, and gathered

enough funds for product research, development and innovation. In May 2000, Jingwei issued stocks for the second time to finance its strategic actions.

Proactive Actions in the Market Place

Jingwei is one of the few companies in China with advanced CIMS, which increased the firm's capability in quick response to market demand. The integration of information processing and research and development capability provides competitive advantage to Jingwei. Each year, the company purchases for research purposes the most advanced equipment and facilities in the world such as computer numerical controlled machines, flexible production lines, etc. As CEO Chen noted that he had all the best machines in the world for his business. Based on the new development in the global market, Jingwei tries to innovate and create new product for the next generation, and gain the first mover's benefits. Chen explained that market followers were always playing catch-up and were always attempting to meet the strategic minimum in the market. Without proactive actions, he continued, the firm would never win in the market place.

Strategic Asset Restructuring

When talking about the strategic responses to challenges facing Jingwei, Chen commented that strategic asset restructuring is one of the core actions leading to competent organizations. In the past, the lack of scientific scheduling and market demand-supply mechanisms lead to the common practice in China of duplicating production capacity, resulting in over capacity in the market. Today, most firms were restructuring assets, though some had not done a good job. Many firms spun off some of

their units along the value chain, attempting to focus on their core competence. But Jingwei adopted a related diversification strategy. In the past, the textile machinery made in Jingwei could only produce fine cotton yarn, which is the last of five cotton processes. Now Jingwei can provide a complete set of high quality machines for cotton processing. Chen made an analogy: "In the past, we were only one war ship, and other producers were independent ships fighting on their own, whereas now we have grown into a fleet of ships, enjoying economies of scope." In fact, what Jingwei had done is to combine the advantages of different assets and optimize the operation. Jingwei has now taken the lead in its industry.

Strategies for Human Talents

In order to attract the best people in the industry, Jingwei moved its headquarter from Shanxi Province to Beijing, with the production base in Shanxi. The Technology Center was set up in Beijing, with responsibility to research and develop new products. Because the production base and Technology Center are far away from each other, in two different localities, different pay and compensation systems were used. Now there is no problem with internal equity to use market pay or better pay to attract and keep technical people in the organization. There are other ways that have been used in economic terms. For example, the firm purchased a flat that is worth 1.4 million yuan. Every month the firm would pay most of the mortgage. If the person stays in the firm for 10 years, then the flat would become that person's property. So people will think hard before deciding to leave the company.

Evaluation of Performance

Competitor Sales Analysis

Jingwei reported sales of 803.59 million *yuan* ($97.09 million USD) for the year ending December 1999. This represents an increase of 96.2 percent (Table 12) over 1998 when the company's sales were 409.63 million *yuan*.

Table 12. Sales Comparisons (Most Recent Fiscal Year)

Company	Year Ended	Sales (US$mlns)	Sales Growth	Sales/ Emp (US$)	Largest Region
Jingwei Textile Machinery Company Ltd	Dec 1999	97.089	96.2%	11,265	N/A
Shanghai Erfangji Textile Machinery Co.	Dec 1999	35.163	-5.4%	N/A	N/A
Lakshmi Machine Works Limited	Mar 2000	92.581	5.0%	N/A	India (100.0%)
China Textile Machinery Stock Ltd	Dec 1999	33.453	0.7%	5,396	N/A

Source: Wright Investors' Service, 2/23/01.

During 1999, the company's sales increased at a faster rate than the three major competitors in the Asian market[12]: Shanghai Erfangji Textile Machinery Co., Lakshmi Machine Works Limited of India, and China Textile Machinery Stock Ltd. Shanghai Erfangji Textile Machinery Co. reported sales of 291.04 million Chinese Renmimbi ($35.16 million USD) in 1999. In 2000, Lakshmi Machine Works Limited of India had sales of 4.31 billion Indian Rupees ($92.58 million USD), of which 46 percent was

[12] Note: not all of these companies have the same fiscal year: the most recent data for each company are being used.

Spinning preparatory machinery. China Textile Machinery Stock Ltd. generated sales of 276.89 million *yuan* (33.45 million USD) in 1999.

While Jingwei enjoyed a sales increase of 96.2 percent, the other companies saw smaller increases: Shanghai Erfangji Textile Machinery Co. sales were down 5.4 percent, Lakshmi Machine Works Limited increased 5.0 percent, and China Textile Machinery Stock Ltd experienced growth of 0.7 percent

Recent Stock Performance

In recent years, this stock has performed poorly. In 1997, the stock traded at 3.28 *yuan*, versus 1.52 Chinese RMB on February 2001. In 1997, the stock retreated significantly from its high because of its strategic expansion, and by the end of the year was at 0.82 *yuan*. The stock price has more than doubled recently: For the 52 weeks ending 2/23/01, the stock of this company was up 126.4 percent to 1.52 *yuan*. During the past 13 weeks, the stock has increased 38.8 percent.

During the 12 months ending 12/31/99, earnings per share totaled 0.21 *yuan* per share. Thus, the Price / Earnings ratio was 7.23. Earnings per share rose 950.0 percent in 1999 from 1998 (Table 13).

Table 13. Summary of company valuations

Company	Date	P/E	Price/ Book	Price/ Sales	52 Wk Pr Chg
Jingwei Textile Machinery Company Ltd	2/23/01	7.2	0.78	0.80	126.40%
Shanghai Erfangji Textile Machinery Co.	2/19/01	105.2	1.59	4.91	179.25%
Lakshmi Machine Works Limited	2/23/01	4.2	0.41	0.23	-51.47%
China Textile Machinery Stock Ltd	2/19/01	N/A	5.83	3.21	220.00%

This company is currently trading at 0.80 times sales. The three companies vary greatly in terms of price to sales ratio: trading from 0.23 times all the way up to 4.91 times their annual sales. Jingwei is trading at 0.78 times book value. Since the price to book ratio is less than 1, this means that theoretically, the net value of the assets is greater than the value of a company as a going concern.

The market capitalization of this company is 643.10 million *yuan* ($77.70 million USD). Closely held shares (i.e., those held by officers, directors, pension and benefit plans and those shareholders who own more than 5 percent of the stock) amount to over 50 percent of the total shares outstanding: thus, it is impossible for an outsider to acquire a majority of the shares without the consent of management and other insiders. The capitalization of the floating stock (i.e., that which is not closely held) is 21.32 million *yuan* ($2.58 million USD).

Profitability Analysis

On the 803.59 million Chinese RMB in sales reported by the company in 1999, the cost of goods sold totaled 595.94 million Chinese RMB, or 74.2 percent of sales. In other words, the gross profit was 25.8 percent of sales. This gross profit margin is slightly lower than the company achieved in 1998, when cost of goods sold totaled 73.4 percent of sales (Table 14).

The company's earnings before interest, taxes, depreciation and amortization (EBITDA) were 111.89 million Chinese RMB, or 13.9 percent of sales. This EBITDA

margin is better than the company achieved in 1998, when the EBITDA margin was equal to 10.0 percent of sales.

In 1999, earnings before extraordinary items at Jingwei Textile Machinery Company Ltd were 88.60 million *yuan*, or 11.0 percent of sales. This profit margin was an improvement over the level the company achieved in 1998, when the profit margin was 2.1 percent of sales. The company's return on equity in 1999 was 12.0 percent. This was significantly better than the 1.2 percent return the company achieved in 1998.

Table 14. Profitability Comparison

Company	Year	Gross Profit Margin	EBITDA Margin	Earns bef. extra
Jingwei Textile Machinery Company Ltd	1999	25.8%	13.9%	11.0%
Jingwei Textile Machinery Company Ltd	1998	26.6%	10.0%	2.1%
Shanghai Erfangji Textile Machinery Co.	1999	N/A	N/A	2.3%
Lakshmi Machine Works Limited	2000	16.2%	14.6%	5.0%
China Textile Machinery Stock Ltd	1999	N/A	N/A	-63.5%

Inventory Analysis

As of December 1999, the value of the company's inventory totaled 447.71 million *yuan*. Since the cost of goods sold was 595.94 million *yuan* for the year, the company had 274 days of inventory on hand. Another way to look at this is to say that the company turned over its inventory 1.3 times per year. In terms of inventory turnover, this is a significant improvement over December 1998, when the company's inventory was 312.83 million *yuan*, equivalent to 380 days in inventory.

CHAPTER IX. HARBIN ELECTRIC MACHINERY COMPANY LTD.

Harbin Electric Machinery Company Ltd. (HEC), former Harbin Electric Machinery Works, was found in 1951, and was one of the 156 industrial bases that were built with the aide of Russia. HEC is the leading manufacturer of thermal and hydropower equipment and complete power stations in China. HEC has 9830 employees, including technical staff of 1840. HEC has produced an accumulated total capacity of electric power generating equipment of 49000 MW, about one third of total installed capacity of China-made units. HEC has also exported power-generating equipment to Asia, Africa, America, and Europe, and as established substantial economic and technical cooperation relations with 28 overseas firms in 12 countries.

Industry Competitive Situation Analysis

China's electric power industry also experienced an oversupply problem, due in part to slower Chinese economic growth owing to the Asian economic crisis. While residential demand was up 10.5 percent in 1998 over 1997, demand from heavy industry, the main consumer of electric power in China, was unchanged.

The Chinese government responded to the short-term oversupply in part by implementing a drive to close down small thermal power plants and imposing a moratorium on approval of new power plant construction. Most of the small plants are diesel or coal-fired plants, which were opened by provincial or municipal governments as demand grew in the 1980's, and are relatively inefficient and environmentally damaging.

Chinese officials have stated that the moratorium on new power plant construction will be in effect for two years, and three years for new coal-fired plants. To keep China's domestic power equipment manufacturers afloat, a moratorium on purchases of foreign built generators with a capacity of less than 600 MW has been imposed. Even so, as of the beginning of 1999, there was a total of 70 GW of new capacity under construction or with final approval, so there will still be a significant capacity increase in the near future. The largest project under construction, by far, is the Three Gorges Dam, which when completed will power 26 separate 700 MW generators,for a total of 18.2 GW. There are also several nuclear projects under construction, with Russian, French, and Canadian firms involved in several projects.

Another key issue for China's power industry is the distribution of generation among power plants. China's goal is to create a unified national power grid, and to have a modern power market in which plants sell power to the grid at market-determined rates. In the short term, though, traditional arrangements still hold sway, and state-owned power plants that have government connections tend to have a higher priority than independent private plants. Additionally, some private plants with "take-or-pay" contracts, which provide for guaranteed minimum sales amounts, have had trouble getting the provincial authorities to run the local grids to honor those terms.

Domestic Competition

There are approximately 600 domestic boiler factories, which produce residential and industrial boilers, among them Harbin Boiler Factory, Shanghai Boiler Factory and Dongfang Boiler Factory are the biggest, occupying nearly 60 percent of the market.

There are a few large, electric machine factories in Shanghai (Shanghai Electric Machinery Factory), Sichuan (Chengdu Electric Machinery Factory), and Harbin (Harbin Electric Machinery Factory), which all cooperate with foreign companies in the technology field.

Most air pollution control equipment, such as ESP, is produced locally. However, the high cost of FGD systems means that they are still not commonly used and therefore not generally manufactured domestically.

Some institutes and universities also contribute to the development of clean coal technology such as Shanghai Institute of Industrial Boilers and the Second Design Institute of Hangzhou (both of which belong to the State Machine-Building Industry Bureau), Qinghua University, Harbin Institute of Technology, Xi'an Traffic University, and Zhejiang University.

Third Country Imports

Foreign companies occupy 25 percent of the Chinese market. Because of their competitive prices, some European countries have made moderate gains in China. Their strategic entry into China's market is in hopes of being part of its future prospects. Due to their soft loans, Japanese companies also occupy a small percentage of the Chinese

market. Recent projects awarded include the Jiangui Jiujing Phase of the Three Power Generating Co., which was awarded to Hitachi and Itochu (Japan) and Foster Wheeler (US) in March 1998. Valued at US $192 million dollars, the project is to build a coal-fired power plant with 700,000 KW capacities. In June 1998, National Power (UK) announced that it would invest $180 million USD in a coal-fired power station in Changsha, Hunan and an additional $66 million USD with a 49 percent stake in the Shaowu, Fujian plant. On July 2, 1998, Shandong Huaneng Power Development Co. signed two equipment purchase contracts with Deutsche Babcock AG and Siemens AG in which the two companies will supply two 660-megawatt boilers for the Dezhou Power Plant Phase III expansion. The two new coal-fired units are expected to become operational by 2002 and 2003. The total purchase agreement amounted to $160 million USD.

US Market Share

During the Summit between Presidents Bill Clinton and Jiang Zemin in October 1997, the United States announced an initiative of cooperation in energy and environmental science, technology and trade between the two nations. A joint program of conducting research and expanding efficiency and clean energy technologies was planned. Such expanding cooperation between China and the United States will open new investment and trade opportunities for U.S. companies, as U.S. technologies can help China meet the challenges of its energy and environmental needs. U.S. companies can concentrate on providing four main areas of technology to the Chinese market, those for improving

coal quality, increasing coal-combustion efficiency, improving post-combustion particulates and improving coal use in urban households.

In May 1998, the Meizhou Wan power plant received final approval. This 700 MW coal-fired power plant is the first wholly foreign-owned and offshore funded power project. The plant would be run by Fujian Pacific Electric, 70 percent of which is owned by Intergen (a 50-50 JV between Bechtel Enterprises of the U.S. and Royal Dutch Shell). Operations were expected to begin in 2000. On June 26, 1998, the joint venture Zhejiang Wenzhou Telluride Power Generating Co. was established. The cooperative JV will begin building a 600 MW coal-fired power plant near Wenzhou, Zhejiang at the end of the year. The plant is scheduled to open for operation in 2001. The joint venture is composed of affiliates of the U.S. based Oxbow Power Corp. and Sithe China Holdings (40 percent), Zhejiang Provincial Power Development Co., China (30 percent), and Wenzhou Power Investment Co., China (30 percent).

On July 1, 1998 a power plant JV agreement was signed between Johnston Southern Development Co. (Southern Energy Co. and Johnston Development Co.) and Shanxi Enhua Co., China. The $500 million USD project will build two 300 MW coal-fired power units in Shanxi province. The project will use domestic products and is one of the first large-scale power plants to be sponsored by China's coal industry.

Company Profile

The main products of HEC are hydro turbine, hydro generators, turbo generators, synchronous compensators, synchronous motors, asynchronous motors, D.C. motors, D.C. dynamometers, Eddy current dynamometers, complete equipment and auxiliaries

including main value, governor, oil pressure unit, control system and elements, field exiciation system, hydrogen, oil and water control systems. HEC has various kinds of manufacturing equipment over 3800 pieces, has annual production capability of turning out turbo generators of total capacity 3500 MW, hydro units of total capacity 800 MW, and AC & DC machines of total capacity 600 MW. The maximum unit capacity of the hydro power generating units produced by HEC is 300 MW for Francis turbine and 200 MW for Kaplan turbine. The maximum unit capacity for the turbo generator is 600 MW, 42 MW fir the AC motors, 5.5 MW fir the DC motors, and 60MW for the condensers.

Strategic Challenges

Global Competition

Globally, the electric equipment market is matured for the developed countries. Many giant electric equipment and facility manufacturers in the developed countries suffer from drastic decrease in production owing to a steady drop of market demand. Merges, restructuring and acquisition became a common practice in this industry all over the world. Zheng, the Vice President, explained that well known companies such as GE, and Westinghouse Electric Company, were doing well in 1970s and 1980s, when they generated more than 20 million kilowatts every year. But things started to go from bad to worse from late 1980s. When Zheng visited GE in early 1999, he saw in the factory of 0.1 million square meters had only one 0.35 million kilowatt generator for Qilihe in China.

Like General Electric (GE), most of the famous electric equipment suppliers focused their attention on the China market, where there was steady increase of demand because of the fast development since 1978. The coming in of these companies equipped with advanced technology and rich production experiences has made the life harder for the Chinese domestic electric manufacturers. Since 1995, more than 40 percent of Chinese market has been taken by the foreign suppliers.

Domestic Competition

In 1960s, China duplicated factories and moved them to the inland areas of China owing to the poor relationship with USSR. Oriental Electric Motor Factory (OEMF) was one of these examples. HEC sent its best people and best factory facilities to Sichuan to set up OEMF, which has the same production capability, production lines and products, and even the same management style. Today, this factory is the major competitor for HEC because they produce the same products and compete for the same customers.

Another major threat comes from joint ventures in China. Until 1995, HEC was one of the biggest manufacturers in the industry. It hardly worried about the market for its products because of its technology, good quality products, and solid relationship with customers. However, since 1995, the Chinese government has allowed foreign manufacturers into the domestic market. Most foreign companies venture with domestic companies and provide the technology and new production lines, while domestic firms provide the marketing know-hows and distribution channels in China. These joint

ventures have competitive advantages over HEC because they have better manufacturing facilities, flexible production lines and lack the social burden of HEC.

Incomplete Restructuring

HEC went through a company-wide restructuring in October 1994 that separated the social responsibilities such as hospital, schools, kindergartens, etc. from HEC. At that time, HEC had 12,500 people, and 2,500 were spin off to establish the Harbin Electric Enterprise Development Co., Ltd. The major purpose of restructuring at that time was to get its stock issued to the public in Hong Kong. It has been more than seven years since the restructuring, but HEC is still responsible for financing that part of the social responsibility. Every year, HEC has to allocate about 60 to 70 million *yuan* to those separated units. These not-for profit units need money to increase their employees' pay to adjust for inflation, and bonuses to attract and keep people.

High Turnover of Key Employees

Low pay is the major problem causing high turnover of key employees, especially the technical work force. Many employees work in HEC for six to eight years after graduation from universities to become experts in various departments. They are then hired away by other firms, particularly by joint ventures, privately-owned branches of foreign-owned companies, where the pay and other benefits are seven to ten times better than HEC's. Vice President Zheng explained that an HEC account manager, who was very knowledgeable and competent, earned 1000 yuan in HEC per month and lived in a flat of about 50 square meters. Mawan Electric Power Plant in Shenzhen recruited him

for 20,000 yuan a month, plus a house of more than 100 squared meters in addition to a personal car. HEC could not compete.

Lack of Technicians

HEC was one of the key enterprises in China. From 1959 to 1998, each year the state would assign graduates from key universities to work for HEC. Now things are different. Students are no longer assigned to work by the state. The principle of Three Satisfactions was used in university students' jobs hunting: Satisfaction from the university, Satisfaction from the student, and Satisfaction from the parents. Since then, HEC hardly attracts any high-quality graduates from key universities because they have better alternatives, where they can get much better compensation. In addition to being unable to recruit top graduates, competent people have left the company. Human resources have become one of the critical threats to the future development.

Strategic Responses

Strategy for Technological Innovation

HEC established an R&D center, the high-caliber Harbin Research Institute of Large Electric Machinery, which is the base for significant scientific research and product development for HEC. It is also the advisory body and leading institute for all the large electric machinery and hydro turbines in the country. The institute has 40 test stations equipped with advance testing and measuring facilities, and a workshop. It has seven research sections, including electric machine testing, hydro testing, ventilation testing, etc., and a workshop for machining tested components. The institute is equipped with an

internationally advanced high head hydraulic test stand, and a 3000-ton thrust bearing test stand. Both are world class. It mainly conducts testing, research, and development of large hydroelectric power generating units, large turbo-generators, large AC & DC motors and control equipment related to electric machinery products.

HEC has attempted technological innovation, and developed some high-tech products to differentiate from other competitors. The long-term objective is to keep the competitive edge by sustaining some products or technology that are hard for other firms to imitate and expensive to copy.

Quality Strategy

In the process of reform and development, HEC has improved its technical, and product quality level significantly. HEC has formed an excellent quality "assurance system and obtained the certificate for qualified quality system of " GB/T19001. HEC has adopted overall quality control and work site management systems. All the main products are produced to international standards. The company has been ISO 9001 certified since 1994.

Project management techniques, with quality control as its core, control project quality and meets the requirements of customers and contract specifications. According to ISO9001 certification initiated in 1994, HEC had a good quality system, including a quality assurance standard of design, development, manufacture, installation and service. Certification (No. 96003) was issued by VTI of China on April 25, 1996, and issued by FMRC (96081. IV) of U.S.A on August 5, 1996.

HEC issues a Quality Plan for specific projects, in which specific quality precautions, source and sequence of activities are stipulated, and the objective of quality control over the project is defined. With quality control management, HEC can provide its customers with confidence and objective evidence that it can supply you reliable premium quality power equipment and facilities.

Product Strategy

HEC has established the marketing strategy that is profit centered, led by product development, ensured by excellent quality, bases on scientific administration, and driven by the market. HEC introduced and optimized 60 MW turbo generators, 210 MW turbo generators for Pakistan and 2050 rolling mill motors manufactured to internationally advanced standards on both product quality and technological attributes. HEC won the State's scientific and technical progress super grade prize and gold medal prize for Gezhouba 125 MW hydro units and silver medal prize for Yunfeng 100MW, Taipingwan 47.5 MW hydro units. HEC was awarded National Grade I Enterprise, "May 1st" Labor Prize Certificate, Quality Control Prize of MMI, National Excellent Enterprise (Gold Horse Prize).

HEC has built a modernized turbo-generator workshop with a 36 M span, a crane of 400 tons, and a world-class stator frame machining center and shaft machining center. HEC has solved the machining and transportation problems of large pieces for Yantan power plant on the Coast of Bohai Sea that will help the Three Gorges project.

After several technical improvements between China's Seventh and Eighth Five-Year Economic Plans. HEC reached an annual output of 3,500 MW for turbo generators, 800-1,200 MW for hydro power generating units and 600 MW for AC and DC motors. HEC now can produce 300 MW and 600 MW turbo generators in batches.

By the end of 1997, HEC had produced altogether 57,466 MW for power generating equipment and 11,733 MW for DC and AC motors. The hydropower generating units produced by HEC accounted for more than half the total installed capacity produced domestically in China and HEC installed 120 hydro power stations in 22 provinces. The turbo generators made by HEC accounted for one third of the total installed capacity and HEC installed 132 thermal power plants in 22 provinces.

HEC has exported products to Canada, Congo, Korea, Pakistan, the Philippines, Turkey, U. S. A., Venezuela and some other countries. The contract value of the exported products is up to 345 million USD.

Strategy for Business Alliance

Recent years, HEC has built up close cooperation relationships with about 30 companies in 12 countries. It has established good strategic partnerships with Hitachi, Siemens, Voith, C. G. E. LME, and periodically exchanges technologies between each other. HEC and Bohai Bay Shipbuilding Works have formed a joint venture, the Northeast Binhai Hydroelectric Large Machinery Plant, where it installed large scale manufacturing equipment such as the 16 M vertical lathe, ∅250 milling machine, ∅12.6m furnace, and

welding positioners. Large hydroelectric equipment can be made in this plant and delivered directly by sea.

Evaluation of Performance

HEC is prepared to contribute to the coming Three Gorges project, 1000 MW nuclear turbo generators, and other power plants in the bright future. After forty years' of establishing and developing a team of employees with proficient skill and knowledge, HEC's spirit is to "unite to struggle, persist in forging ahead, warmheartedly dedicate".

HEC produced an accumulated total capacity of electric power generating equipment of 49000 MW, about one third of total installed capacity of China -made units. These units include 230 thermal and hydro power plants in China and 11000 MWs of AC & DC motors, meet the demands of China's metallurgical, mining, petrochem, electric power and defense sectors. HEC has also exported power-generating equipment to Asia, Africa, America, and Europe, and as established substantial economic and technical cooperation relations with 28 overseas firms in 12 countries.

Since 1985, HEC has been awarded more than 50 prizes and honors by the nation, province and Harbin City for its excellent quality of the products and the progress of the technology. The 125 MW hydro power generating unit for the Three Gores Power Station gained the national gold medal. The 100 MW hydro power generating unit for Yunfeng Power Station and 47.5 MW hydrogenerating unit for Taipingwan Power Station gained the silver medal for the excellent quality.

Sales Analysis

HEC enjoyed sales of 2.96 billion yuan (357.45 million USD), of which sale of goods accounted for 66 percent of 1999 revenues; services rendered, 31 percent and sale of properties, and 3 percent for power stations (Table 15). HEC is the leading manufacturer of thermal and hydropower equipment and complete power stations in China. Additional products are power equipment accessories and parts and A.C./D.C. motors. Important sources of revenues are services to existing power stations and other products. The firm operates in the whole Asian market but has only domestic subsidiaries.

Table 15. Sales and Profitability Summary (Figures expressed in billions *yuan*)

Year	Sales	Sales Growth	EBITDA	% of sales	Inc. bef Extra	% of sales	Emps	Sales/ Empl
1994	2.396	n/c	0.450	18.8%	0.178	7.4%	27,500	87,134
1995	2.668	11.3%	0.407	15.3%	0.122	4.6%	26,971	98,920
1996	2.403	-9.9%	0.359	15.0%	0.085	3.5%	26,609	90,301
1997	2.596	8.0%	0.359	13.8%	0.088	3.4%	26,000	99,845
1998	2.865	10.4%	0.374	13.1%	0.075	2.6%	n/a	n/a
1999	2.959	3.3%	n/a	n/a	0.035	1.2%	n/a	n/a

The following analysis compares HEC with three other major manufacturers in Asia: Greaves Limited of India, Shanghai Diesel Engine Company Limited, and Changchai Co., Ltd. (Table 16). In 1999 Greaves Limited of India enjoyed sales of 6.15 billion Indian Rupees [$132.16 million USD] of which 43 percent was Engines. Shanghai Diesel Engine Company Limited had 1.15 billion Chinese RMB ($138.93 million USD), and Changchai Co., Ltd had 3.09 billion Chinese RMB ($373.85 million USD]).

Table 16. Sales Comparisons (Fiscal Year ending 1999)

Company	Year Ended	Sales (US$mlns)	Sales Growth	Sales/ Emp (US$)	Largest Region
Harbin Electric Machinery Co., Ltd.	Dec 1999	357.454	3.3%	13,748	N/A
Greaves Limited	Mar 1999	132.165	-3.5%	N/A	India (100.0%)
Shanghai Diesel Engine Company Limited	Dec 1999	138.933	-31.5%	15,969	N/A
Changchai Co., Ltd	Dec 1999	373.849	12.0%	78,738	N/A

Profitability Analysis

In 1999, earnings before extraordinary items at HEC were 34.64 million Chinese RMB, which was 1.2 percent of sales. This profit margin is lower than the level that the company achieved in 1998, when the profit margin was 2.6 percent of sales. The company's return on equity in 1999 was 1.2 percent. This was a decline in performance from the 2.6 percent return that the company achieved in 1998. (Extraordinary items have been excluded).

Achievements on Project Contracting

By the end of 1997, the total capacity of power station projects that were finished was 18260 MW with 35 power stations and 78 units. The capacity of international projects was 6200MW with 12 power stations and 31 units (Table 17). The capacity of domestic projects is 12060 MW with 23 power stations and 47 units (Table 18). Among them, the capacity of turn- key project was 3997 MW with 15 power stations and 29

units, and the capacity of equipment supply and technical service project was 14263 MW with 20 power stations and 49 units.

Table 17. Achievements for International Projects

No.	Country	Name of power Station and Unit No.	Capacity	Contract Mode	Year of Contract Signing	Completion time	Remarks
1	Pakistan	Guddu Thermal Power Station Unit No.4	210 MW	General Contracting	1983	1986	Oil/Gas-Fired
2	Pakistan	Jamshoro Thermal Power Station Unit No.2.3&4	3x210 MW 1991(Unit3) 1992(Unit4)	General Contracting	1987	1990(Unit2)	Oil/Gas-Fired
3	Philippines	Angat Hydropower Station Auxiliary Unit No.5	18MW	General Contracting	1990	1992	Type: Francis Head:96m Speed: 400rpm Frequency: 60Hz
4	Pakistan	Kotri Gas-Steam Combined Cycle Power Plant Faisalabad Gas-Steam Combined Cycle Power Plant	2x47 MW	General Contracting	1991	1994	Combined Cycle
5	Pakistan	Muzaffargarh Thermal Power Station Unit No.5&6	2x210 MW	General Contracting	1991	1995	Oil/Gas-Fired
6	Vietnam	Hiep Phuoc Power Station Unit No.1.2&3	3x125MW	General Contracting	1993	1997(Unit1) 1997(Unit2) 1998(Unit3)	Oil-Fired
7	Pakistan	UCH CCPP	3x120+1 x180MW	With GE Combined Contracting	1995	1997	Oil/Gas-Fired
8	Iran	KARUN III Masjid-e-soleyman	12x250+1 x130+133 MW	Equipment Supply and Technical Service	1995		Hydraulic Equipment
9	Malaysia		650MW	General contracting	1997		Combined cycle

Table 18. Achievements for Domestic Projects

No.	Location	Name of power Station and Unit No.	Capacity	Contract Mode	Year of Contract Signing	Completion time	Remarks
1	Anhui	Pingwei Thermal Power Station Unit No.1&2	2x600 MW	Main Equipment Supply and Technical Service	1984	1988	Coal-Fired
2	Heilong-jiang	Shuangyashan Thermal Power Station Unit No.1&2	2x200 MW	All Equipment Supply and Technical Service	1984	1988	Coal-Fired
3	Harbin	Harbin Third Thermal Power StationUnit No.1&2	2x200 MW	Main Equipment Supply and Technical Service	1986	1988	Coal-Fired
4	Jilin	Hunjiang Thermal Power Station Unit No.5	1x200 MW	All Equipment Supply and Technical Service	1987	1991	Coal-Fired
5	Shan-dong	Huangtai Thermal Power Station Unit No.1	1x300 MW	Boiler Supply and Technical Service	1987	1990	Coal-Fired
6	Shan-dong	Hualu Thermal Power Station Unit No.1&2	2x300 MW	Main Equipment Supply and Technical Service	1988	1993	Coal-Fired
7	Guang-dong	Zhujiang Thermal Power Station Unit No.1.2.3&4	4x300 MW	Main Equipment Supply and Technical Service	1988	1997	Coal-Fired
8	Heilong-jiang	Daqing Thermal Power Station Unit No.1.2&3	3x200 MW	All Equipment Supply and Technical Service	1988	1991 1992 1993	Coal-Fired
9	Inner Mongolia	YuanbaoshanThermal Power Station Unit No.3 & 4	2x600 MW	Main Equipment Supply and Technical service	1990	1997 1998	Coal-Fired
10	Liao-ning	Tieling Thermal Power Station Unit No.1.2&3 Unit No.1.2.3.&4	4x300 MW	Main Equipment Supply and Technical Service	1990	1992 1993 1994 1995	Coal-Fired
11	shenzhen	Mawan Thermal Power Station Unit No.1&2	2x300 MW	MainEquipment Supply and Technical Service	1991	19931994	Coal-Fired
12	Henan	Dengfeng TPS ext. Unit No.1.&2	2x50 MW	All Equipment Supply and Technical Service	1993	1995	Coal-Fired
13	Hebei	Xibaipo Thermal Power Station Unit No.1&2	2x300 MW	Main Equipment Supply and Technical Service	1991	1993	Coal-Fired
14	Inner Mongolia	Shuangliao Thermal Power Station Unit No.1 &2	2x300 MW	Main Equipment Supply and Technical Service	1992	1994	Coal-Fired

15	Shenzhen	Mawan Thermal Power Station Unit No.3&4	2x300 MW	Main Equipment Supply and Technical Service	1993	1995 1996	Coal-Fired
16	Harbin	Harbin Third Thermal Power Station Unit No.3&4	2x600 MW	Main Equipment Supply and Technical Service	1990	1995	Coal-Fired
17	Baotou	Tianjiao Unit No.1&2	2x100 MW	General Contracting	1996	1998	Coal-Fired
18	Luannan	LuannanThermal Power Station Unit No.1&2	2x50 MW	General Contracting	1996	1998	Coal-Fired
19	Hefei	Hefei 2ndThermal Power Station	2x350 MW	Boiler completing and design Combined with GE	1996	1999	Coal-Fired
20	Hunan	Nan Fang Thermal Power Station	3x25T/H +2x1.2 MW	General contracting	1997	1999	CFB

CHAPTER X. ANALYSES AND DISCUSSIONS

The conceptual framework for this dissertation (Figure 3) is based on the holistic strategic challenge & response model derived from Hofer's (1973) preliminary research (Figure 1). This framework, which is built on the concept of business strategy, has proved to be an effective analytic tool in studying the patterns of strategic behaviors of business organizations.

This chapter uses the framework to discuss the data from the six research case studies. Chapters Four through Nine describe external and internal challenges and responses of six Chinese state-owned enterprises. In this chapter, the strategic challenges for these firms are first summarized according to their stages of economic transformation and organizational restructuring. The alterations strategy responses (objectives, strategy, functional policies and procedures) are then compared between the firms. Finally, the resulting performance of their strategic responses is discussed.

Analysis of Strategic Challenges and Response Patterns

This study revealed a number of challenges that were common to Chinese state-owned enterprises. External threats to the six enterprises studied in this research included globalization, government, and social responsibility. Common internal challenges to the six firms included technology innovation, IT, human capital, compensation, quality, and branding (Table 19).

Table 19. Perception of Strategic Challenges

Challenges	HJ	BYJC	CHN	SCW	JW	HEC
Globalization	−	+++	+++	++	+−−	+++
Technology	+−	+++	+++	++	+++	++
Government	+−−	+++	+++	+++	++	+−−
Social Obligations	++	+	+	+++	+−−	+−−
Industry Competition	+−	+++	+	++	++	+++
Ownership	+−−	++	+	+	+	+
Financial Constraint	+−−	+	+	++	−	++
Technology Innovation	−	+−−	+−−	++	+−−	+−−
IT	+	+++	+++	+	+−−	+−−
Restructuring	+−−	++	+	+	+	++
R&D and Manufacturing	+	+++	+++	++	+−−	+−−
Product Challenge	+−−	++	+	+++	+	++
Production Safety	−	+	+	+++	+	+
Management	+++	+	+	+	+++	++
Human Capital	−	+++	+−−	+	++−	+−−
High Turnover	+−−	+++	+	+	+−−	+−−
Cost Management	+−−	++	+	+++	+	+
Sales Network	−	++	+−−	+	++	++
Branding	+	++	+++	+	++	++
Quality	+−−	+−−	+−−	+−−	+−−	−−−
Compensation	++	+++	++	+	+−−	+−−

NOTE: +−−: Major influence
+−: Moderate influence
+: Minor influence

HJ: *China Huajing Electronics Group Corporation*
BYJC: *Beijing No. 1 Machine Tool Plant*
CHN: *Chongqing CHN & CHN Ceramics Co., Ltd.*
SCW: *Sichuan Chemical Works (Group), Ltd.*
JW: *Jingwei Textile Machinery Co., Ltd.*
HEC: *Harbin Electric Machinery Co., Ltd.*

External Challenges and Response Reactions

Globalization

Today, there is an overwhelming trend towards globalization. Globalization is the process by which the world's economy is transformed from a set of national and regional markets into a set of markets that operate without regard to national boundaries. In 1978, China opened its doors to the outside world. Since then, China has increasingly

exposed itself to the outside world. China joined the Asian Pacific Economic Cooperation in November 1991, an organization that promotes free trade and cooperation in trade, investment, technology, and other economic concerns. Since the late 1980s, China has been in negotiation with the World Trade Organization (WTO) for membership.

The globalization of markets equates to the globalization of competition. With greater market exposure comes intensified competition, diminishing market dominance by state-owned enterprises, accelerated product life cycles, and deepening performance uncertainty. As China opens itself to the global marketplace, most SOEs, unable to rely on patronage or position for protection, are permanently vulnerable. The scale of the global opportunities, the complexity of the competitive arena, and the relentless performance discipline imposed by the capital markets are forcing these companies to either specialize and become world class and world scale in their chosen field, or exit. In the industries studied, globalization was raising the stakes and forcing national and regional players to double their efforts to compete, or quit. The coming decade will see shakeouts and consolidations in all of China's industries. The battlefield of a global marketplace and its able competitors from around the world are fighting for a share of the Chinese market. Since China is the largest market in the world, competition has lined up at the gate. International accords in preparation for China's membership in the World Trade Organization are opening more markets and expanding access to existing ones, fostering competition, and bringing consumers more choices of higher quality goods and services at lower prices.

For China, globalization brings the development of technology and consequently improvement of the living standards of China's citizens. But once the Chinese markets are opened to global competition, it becomes integrated into the world marketplace. This current economic transformation gives state-owned enterprises little choice but to modernize and prepare to compete or cooperate with the most competitive firms in the world.

By opening China to these global opportunities and threats, its state-owned enterprises have been forced to develop strategies and structures that will allow them to survive. As membership in the WTO nears, the time available for making decisions shrinks. Even though all the organizations in this study realized the threat and challenge of globalization, their perceptions of the challenge differed by industry (Table 20).

Table 20. Perception of Globalization

Perception of Pressure			
	Hi		• Beijing No. 1 Machine Tool Plant • CHN & CHN Ceramics • Jingwei Textile Machinery • Harbin Electric Machinery • Sichuan Chemical Works
	Lo	Huajing Electronic	
		Lo	Hi
		Need of Actions	

Perception and Reaction of Huajing Electronics Group Corporation

When asked how globalization and China's access to WTO would impact Huajing's strategic plan, most senior executives including the chief strategic advisor for China

Huajing Electronics Group Corporation explained that the pressure from market globalization was for better product selection and quality. They did not perceive the necessity and possibility to enter direct completion with international electronics giants such as Intel. They argued that the Chinese market for electronics was so huge that they did not worry about foreign competition. The chief strategic advisor explained that any niche in the Chinese market could feed Huajing for years to come.

Until the arrival of strong foreign competitors, Chinese electronic industry enjoyed the competition umbrella established by the government. With government regulations forbidding price competition, Chinese players were incapable to head-to-head competition with global competitors in product, quality, service, and price.

However, the Industry Competitive Analysis for Huajing in Chapter Nine did not paint the same picture, as they perceived. Their strategic focus was on organizational restructuring and how to create a capable organization with better profitability. Their perception that global competition was not a problem resulted from the limited domestic supply of electronic components as the market continues its rapid growth.

Perception and Reaction of Beijing No. 1 Machinery Tool Plant

Beijing No. 1 Machinery Tool Plant (BYJC) went through very difficult times when China opened the door wide to foreign competition in the machine tool industry as early as 1994. State-owned enterprises in the machine tool industry suffered their most significant operating losses. Previously, machine tools from SOEs accounted for more than 70 percent of the domestic market, and the Chinese government forbid any producer's request to export machine tools. BYJC leadership position in the industry and

government policy protection made the company quite secure in its position. Prior to 1994, competition was not in BYJC's vocabulary. However, the rule of the game changed when the government relaxed its control of the purchase of machinery tools from foreign countries. Many of BYJC's customers turned to foreign manufactures for products, which had superior features and functions with much better quality and lower prices, placing BYJC on the edge of bankruptcy. More than four decades of central planning had not given Chinese companies opportunities to stand the test of competition, and the manufacturing facilities and technology could not deliver high technology with premium price products needed for the high-end market. At that time, BJYC was driven to the low-end market where customers only needed simple-design machine tools, and the profit margin was very low. Because of the government's regulation of foreign currency, BYJC could not import or update its production facility in a short time. The president and four senior executives told the author that they wanted to see China join WTO as soon as possible so that BYJC could compete on a fair ground as WTO eliminates tariffs and other restrictions on domestic company's ability to export. They believed that foreign competitors have more flexibility and more favorable policies for competition due to Chinese government regulations, such as foreign currency access. In spite of these problems, they explained that after years of hard struggles, BYJC was ready for the global marketplace. They have restructured not only the products, but also the whole company. Technology innovation, agile production, restructuring, and CIMS are the major characteristics in its strategic response pattern.

Perception and Reaction of Chongqing CHN & CHN Ceramics Co., Ltd.

Chongqing CHN & CHN Ceramics Co., Ltd. (CHN & CHN) operates in the ceramics industry, which is a national industry that has never been protected by the government, even under the central planned economic system. Competition from the outside world was fierce, particularly in product design, variety, quality, and price. To survive, CHN & CHN established a focus differentiation strategy targeting the high-end market with premium products. Its global strategy is offensive as the international market contributes around 80 percent of its revenue by the end of 2002.

With the help from the state and provincial governments, CHN & CHN changed its company structure and ownership as early as 1991, thus enabling its aggressive global market strategy. Its heavy investment both in hardware and software in R&D, production, and management allowed CHN & CHN to take the leadership position in China and go after the global ceramics industry. Its global response strategy is proactive and aggressive in product innovations and global distribution channels.

Perception and Reaction of Sichuan Chemical Works (Group), Ltd.

Sichuan Chemical Works (Group), Ltd. (SCW) is in the chemical industry, which has been protected from global competition by the state. It is especially protected in the chemical fertilizer segment because agriculture is the focus of the national policy. In the chemical fertilizer segment, production facilities of most manufacturers were domestically made and outdated. In spite of the firm's hard efforts to improve operations and lower costs, SCW's productions lines needed to be replaced. Because of the heavy social burden placed on SCW, it cannot afford the heavy investments for purchasing new

production facilities. With the ever increasing of price for raw materials, government regulation of prices for finished products have made profit margins thinner and thinner.

SCW was one of the firms in China that dreaded global competition because chemical products from foreign competitors were better in product quality and much lower in price. That is driving SCW to change its product structure, and diversify into related markets. However, cutting costs and improving management proficiency does not relieve its heavy social responsibility in that region. SCW, with its huge social rigidity, has been unable to respond and adapt to the external situation. That was why SCW issued stock to the public to accumulate capital for the needed investment. But SCW's future depends on the speed with which the chemical market is opened after China joins WTO.

Perception and Reaction of Jingwei Textile Machinery Co., Ltd.

Jingwei Textile Machinery Co., Ltd. (Jingwei) identified technological innovation as its first and foremost challenge. The top management team (TMT) in Jingwei shares the belief that Jingwei is facing a challenge of global competition, especially when China joins the WTO, and removes all the protections and tariff barrier. The TMT's major concern is whether Jingwei can survive competition not only with the domestic players but also with more threatening opponents from other countries. Therefore, the TMT decided to change Jingwei's practices rather than playing catch-up after WTO. While the company had historically acquired the most advanced products or technology possible, it had been slow to use them. Frequently, Jingwei had purchased the blue print and the

patent, but took years to digest the new technology and turn it into commercial products. When the products hit the market, they were often no longer advanced, if not obsolete.

Jingwei's strategic responses are to build responsive organization using JW-CIMS to achieve the competitive edge in engineering design, manufacturing agility, and quality control systems. While other organizations are spinning off departments or subsidiaries so as to focus on their core businesses, Jingwei's asset restructuring strategy is to diversify into related business and acquire a complete set of textile production machinery. This strategic made it possible for Jingwei to take the leadership position in its industry. Moving the headquarters to Beijing and establishing branches in five different provinces provided Jingwei with the flexibility to change policy, especially its compensation strategy for attracting and keeping human talents. This critical move helped Jingwei shift its long-term strategic plan from just manufacturing, to global marketing, service, and production.

Perception and Reaction of Harbin Electric Machinery C., Ltd.

Harbin Electric Machinery C., Ltd. (HEC) has learned a hard lessons from global competition. Before the 1990s, HEC was one of the two major manufacturers that dominated the domestic Chinese market. Things started to change when the electric equipment market matured for the developed countries. Many giant electric equipment and facility manufacturers from developed countries suffer drastic decreases in production as market demand fell. Merges, restructuring, and acquisitions became a common practice in this industry throughout the world. To generate business, they shifted their attention to the fast growing emerging markets like China. From 1986 to

1990, imported electric machinery increased from 16 percent of the domestic market to 25 percent. By 1995, the foreign suppliers had more than 40 percent of the Chinese market.

HEC's reactions to the global challenge included technical innovation and development of competitive products. HEC also established strategic partnerships with Hitachi, Siemens, Voith, and C. G. E. LME, with whom they periodically exchange technologies. HEC also worked with some foreign giants and won some big projects in China. HEC obtained agreements with foreign giants for complete technical transfer on joint projects, which is a major step leading to global competitiveness for HEC.

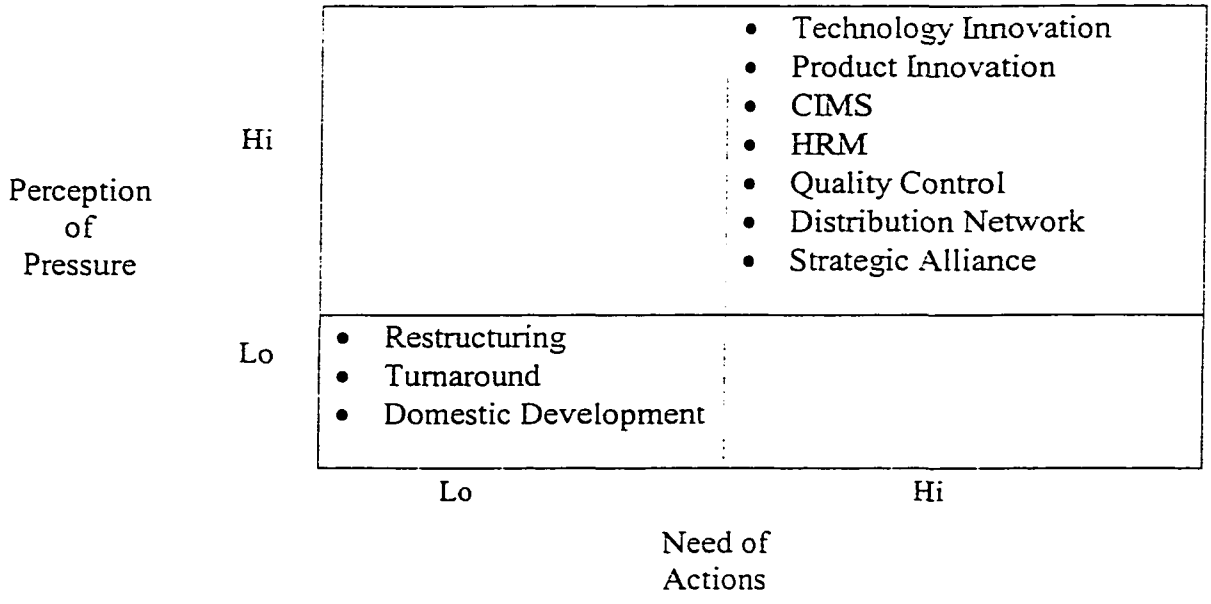
Hitachi and Harbin Electric formed a "Technical Cooperative" agreement in the field of hydroelectric generators, and worked together to capture contracts in this field. This cooperation led to a 1991 contract for seven 235-megawatt generators with Kaplan turbines for a facility in Fujian Province and a 1995 contract for nine 30-megawatt generators with bulb turbines in Hunan Province. Itochu, Hitachi Ltd. and HEC were chosen on November 22, 2000, to supply five generators and turbines for a hydroelectric power station to be constructed in the city of Hongjiang, Hunan province in China. The five generators will have a combined output of 225 megawatts. The plant is the first power station to be constructed under a Japanese government program that extends yen-denominated loans to protect China's environment. The bulb-type turbines will rotate the generators by utilizing energy from the river's current, eliminating the need to build a large dam and minimizing the environmental impact.

Major components of two of the five generators are to be produced by Hitachi, with assembly to take place in China. Hitachi will share its technology in this field with HEC, thus, establishing a production capability in China. This cooperation is expected to allow the fifth generator to be fabricated almost entirely by HEC.

On May 22, 2000, the French company Alstom Power was awarded 14 units of the governor system worth 12.76 million USD. Voith Siemens Hydro Power Generation, from Germany, was chosen to provide 14 units of the excitation system worth $12.79 million USD. HEC was chosen as the Chinese subcontractor. The two winners have committed to transferring their advanced technology to the Chinese subcontractor, thus guaranteeing that HEC will manufacture five units of the two different systems with final assembly and system test.

Table 21 sums up the strategies taken by different companies as they respond to the different perceptions concerning the pressure from globalization.

Table 21. Summary of Strategies



Technology

One major driving force that has made the globalization a reality is technology. The world has entered a new epoch, in which technology is developing at an extremely rapid pace. Previously, the impetus for technological development was driven by the needs of war and military forces. While the importance of the military has been diminished, the development of technology has reached a point of no return, and cannot be slowed down. Today, the technology is driving market competition.

Technology is also the engine of economic growth. It underpins China's fastest growing industries, provides the tools needed to compete in every business, and drives growth in every major market segment. Today, technological leadership often means the difference between success and failure in the global marketplace for companies. Chongqing CHN & CHN Ceramics Co., Ltd., which developed its core competencies with the integration of the most advance hardware and software in the world, provides a good example.

Technical progress is the single most important determining factor in sustaining economic growth. Increases in productivity have long been recognized as one of the primary mechanisms by which technology contributes to growth. Advanced technologies were used to enhance performance in virtually every important category for the six focal organizations. Compared with other competitors, all the firms used advanced technologies to improve productivity and profitability, allowing them to pay higher wages, and increase employment more rapidly than less technical firms. Beijing No. 1 Machine Tool Plant and Jingwei Textile Machinery Co., Ltd. used computer numerical

control technology and flexible production machine tools to gain the competitive advantage in the domestic market, and to move into the traditional and low-end markets using this technology with low prices.

Technology is transforming the very basis of Chinese competition, enabling large businesses to perform high-quality design, and manufacturing work, while achieving the speed, flexibility, and closeness to customers that were once the sole domain of smaller firms. Technology provides the tools for creating a spectacular array of new products and new services. Chongqing CHN & CHN Ceramics Co., Ltd. employed the Computer Integrated Manufacturing System (CIMS) in the traditional ceramic production (CPCIMS). Beijing No. 1 Machine Tool Plant and Jingwei Textile Machinery Co., Ltd. used CIMS to integrate functionalities in machine tools operations. Harbin Electric Machinery Co., Ltd. utilized the same technology in the electric machine business. These four companies used information technology and modern management technology with manufacturing technology to integrate operations, including design, business and manufacturing processes. Time to market, quality, cost, and service (TQCS) were improved through information integration of processes and resource optimization.

CIMS helped realize the cooperation and design integration to improve production efficiency. It also allowed for powerful supporting systems such as computer network system, database system, and functional systems including product engineering design systems (EDS) and management information systems (MIS). The EDS included database management of computer-aided design (CAD) as well as computer-aided

process planning (CAPP) for products. The MIS integrated sales, production, purchasing, storage, accounting, and personnel.

CIMS now provides data gathering, analytical, and test capabilities for complex process design and manufacturing engineering. In process design, software allows inexpensive experimentation, yield prediction, workstation design, process layout, alternative testing, three-dimensional analysis, network manipulation, quality control, and interface timing capabilities that would otherwise be impossibly expensive. CIMS is especially helpful in allowing workers, technologists, and managers to visualize solutions and work together on complex systems. Further, knowledge-based CIMS now allows the design coordination, manufacturing monitoring, and logistics control needed to find and source innovative solutions worldwide.

CIMS provided the central vehicle enabling the inventor-user interactions, rapid distribution of products, and market feedback that add most value to new product innovations. It allowed multidisciplinary (marketing-manufacturing-development) teams to interact continuously with customers all over the world, capturing their responses through video, audio, physical sensing, and computer network systems. For example, Chongqing CHN & CHN Ceramics Co., Ltd. can involve its customers simultaneously in the design of new or customized ceramic products for the preferred patterns and shapes, colors, and decoration. Such customer participation is a crucial element in both lowering risks and enhancing the customer value of designs. More important, by designing "hooks" in CIMS to allow customers all over the world to innovate further on their own,

CHN & CHN can leverage their internal capabilities enormously by tapping into their customers' sophisticated creative ideas.

Chongqing CHN & CHN Ceramics Co., Ltd. can entirely eliminate many traditional steps in the innovation process using CIMS and can consolidate others into a simultaneous process. CIMS can also provide the communication mechanisms and a disciplined framework for the detailed interactions that multidisciplinary departments and their customers need to advance complex innovations rapidly. This has cut development time and cost. Through rapid 3-D "virtual" prototyping rather than conventional tooling and physical delivery of samples, CHN & CHN reduced greatly the time needed for prototyping samples, which had been one of the major reasons for customer dissatisfaction and loss of product contracts.

In the executive interviews, most stressed the significance of technology, which was the decisive factor in the speed with which they could create knowledge and put it to work, thereby determining the firm's position in the international marketplace for the next century. Advances in technology has spurred their growth and creation of core competencies, facilitated the conduct of business worldwide, and accelerated the development of new products, services, and capabilities. With such technology, SOEs can respond quickly and flexibly to ever changing global market demands with high-quality, customized goods and services at competitive prices.

In sum, CIMS helped build sustainable distinctive competences to achieve a competitive edge both in the domestic and the international market. The firms using this technology have gained access into global markets, and become the regular members of

the global club. The major purpose of improving management's approach at SCW was to improve working efficiency and cut costs. This approach has limited the management's mindset and its strategic vision, and thus the firm's ability to expand its business. While Huajing Electronics is equipped with advanced production technology, it is busy restructuring and turning around the company from heavy operation losses. Without the help of such technologies as CIMS, these two organizations have not achieved the economies of scope. In other words, they neglected the interaction effects of their critical functionalities.

Government

Until passage of the State-Owned Enterprises Law in 1988, which distinguished the rights and obligations of the government (as owner) from those of the firm, firms belonged to government departments; their losses being covered through budgetary allocations or directed bank loans. The government is now separating some commercial activities from government bureaus, though not yet complete. The government could not longer afford the inefficiencies and losses financed explicitly through the banking or budgetary systems. In the 1990s, the most significant aspect of China's economic reform was in transforming state-owned enterprises into independent legal entities responsible for their own profits and losses. Redefining government functions was viewed both as a prerequisite and a logical consequence of such reforms of state enterprises. The thrust of economic restructuring was thus separating government from enterprises and the promotion of a "small government, big society." The latter implies that governments at

all levels should limit their functions and allow people to acquire the goods and services they want from the market.

The 15th Communist Party Congress held in September 1997 agreed to undertake fundamental restructuring of the state-owned enterprises. While the shareholding system will become the major form of ownership, the government will continue to be a major shareholder and support reforms of 1,000 large-sized SOEs, while other SOEs will be allowed greater autonomy in restructuring. Since 1997, the number of mergers and acquisitions, and bankruptcies among SOEs has increased. Moreover, a series of concrete steps have been taken to improve the debt/asset ratio of SOEs by converting debt into equities, to reduce SOEs' social responsibilities. The government's goal was to make the loss-making large SOEs profitable within three years. By the end of 1999, all the six SOEs in 6 industrial sectors in this study reported profits or stopped making losses.

After the Fourth Plenary Session of the 15th Communist Party Congress held in September 1999, the government reaffirmed goals to improve the debt/asset ratio of SOEs (by converting debt into equities) and to reduce SOEs' social welfare obligations through 2010. The state no longer intends to be the controlling shareholder except in certain strategically important sectors.

The Third Plenary Session of the 15th National People's Congress (CNPC) held in March 2000, reiterated the government's three priorities: to continue implementing fiscal-stimulus policies, to continue strategic economic restructuring and SOE reforms.

As for corporate structure, the government has chosen to adopt the modern corporate form, in which the owner elects a board of directors to oversee the daily operations of the firm by professional managers. The government has also set up an elaborated state asset management system to monitor the performance of state enterprises and ensure that their assets are preserved. But progress has tended to lag behind policies. The state asset management system is short on qualified staff, budget, and motivation. None of its institutions receives timely, accurate financial information. It is not clear whether, even with time, the new arrangements will ensure that enterprises are properly managed in an increasingly competitive environment.

The government has little time to improve the efficiency and competitiveness of these large enterprises. Many will be exposed to international competition once China joins the WTO. Still, it is best to make tough decisions now, while firms still have time to cut costs, reconfiguring their operations, and improve competitiveness. In this matter, the government should consider diversifying ownership so that firm-level changes are based on purely commercial criteria and that risks are spread across many shareholders. Since change is inevitable, delays will only add to costs, force defensive adjustments under market pressures, and to add to the bad debt of banks.

The government has been trying to turn SOEs, particularly large and medium-sized ones, into shareholding companies. Under the shareholding system, the State will retain controlling stakes in large SOEs in strategic industries but is willing to reduce its total share of ownership in other SOEs. The shareholding system will help SOEs raise

capital on domestic and overseas stock markets and at the same time allow partial divestiture of SOEs to nonstate interests.

In the early 1990s, the organizations in this study were 100 percent state invested entities belonging to the state government. Chongqing CHN & CHN Ceramics Co., Ltd. changed their ownership structure in 1993, and Jingwei Textile Machinery Co., Ltd. became a joint venture in 1996. Harbin Electric Machinery Co., Ltd., and Sichuan Chemical Works (Group), Ltd. have completed their transition to the corporate shareholding system. Beijing No. 1 Machine Tool Plant, and China Huajing Electronics Group Corporation remain unchanged.

The government's National High-Tech 863 Programs was established in March 1986, for high technology research in biotechnology, energy conservation, aerospace, mechatronics, advanced materials, information, and micro-electronic developments. The program for automation technology specified companies for implementation of results. Much of the research was funded through the National 863 High Tech Program. It involved over 3000 researchers, 650 research projects, and 250 company applications. There are seven engineering labs involved in CIMS-ERC programs (including Beijing, Shanghai, Huajing, Xian, and Shengyang). There are 10 training centers. CIMSNET was developed to aid in interactive design and manufacturing activities that occur in different cities/locations. Some 200 firms have used CIMSNET. Results have already shown significant improvements in productivity and sale. Four of the six companies studied in this research, including Beijing No. 1 Machine Tool Plant, Chongqing CHN & CHN Ceramics Co., Ltd., Harbin Electric Machinery Co., Ltd. and Jingwei Textile

Machinery Co., Ltd., have developed and applied CIMS to integrate their functionalities and enhance their core competencies.

In conclusion, the firms in this study believed that they faced institutional problems, largely due to the following policy-related obstacles:

1. China has yet to establish a fully liberated enterprise environment, thus laws protecting private property cannot be effectively enforced;

2. Lacking a highly efficient capital market, the securities market has become the principal means to resolve the funding difficulties of state-owned enterprises;

3. The labor flow is restricted by such means as the household registration system and the incompleteness of the social security system; and

4. Nongovernmental capital cannot freely enter many areas. For example, China's postal system recently prohibited nongovernmental express delivery companies from conducting mail delivery businesses.

Industry Competition

Under the central planned economic system before 1978, industrial firms never experienced competition against one another because everything for in the industrial sector was planned in details first by the central government at the macro level, and then at provincial level. Competition was strictly limited by state policies and regulations, which had the effect of creating strong barriers to entry. Firms got so used to this

operation mode that they panicked when the competition barriers were removed and firms had to compete for the market share for survival.

The industry competition came from three sources. First, China's open door policy, and its establishment of 14 special economic zones led to a rapid expansion of trade and foreign investment. In the 1980s, investors from Hong Kong provided the bridge between the domestic producers and foreign customers since few mainland firms had experiences or business connections with foreign countries after decades of self-reliance and close-door operations. China's south coast regions, Guandong Province (next to Hong Kong) and Fujian Province (next to Taiwan) in particular, were the direct beneficiaries from this policy change since mostcapital, skills, and commercial contacts from overseas Chinese. Second, China's rural reforms led to the rapid rise of agricultural productivity that in turn generated a rural labor surplus and ballooning rural savings that provided the resources for the rapid entry and growth of new rural enterprises. Shanghai, Jiangsu and Jiejiang lead the country in industrial enterprises of township and village nature. Entrepreneurial leaders in hundreds of counties and thousand of production brigades were poised to take advantage of deregulation by bursting into markets that they had coveted for years. Many of these firms later joint ventured with foreign partners to compete in the national and/or international arena. Finally, China's long-standing policy of duplicating state-owned production capabilities and operations in most provinces in case of war had created a ready-made source of competition (Jefferson & Singh, 1997).

In this study, firms facing the most challenge in its industry were Beijing No. 1 Machine Tool Plant, Harbin Electric Machinery Co., Ltd., Jingwei Textile Machinery

Co., Ltd., Sichuan Chemical Works (Group), Ltd. and China Huajing Electronics Group Corporation, among which Harbin Electric Machinery Co., Ltd., and Beijing No. 1 Machine Tool Plant had the most difficult time in coping with the industry competition. Chongqing CHN & CHN Ceramics Co., Ltd. was not influenced much because it differentiated itself as early as 1993 from the majority of the industry and focused on the high-end segment with the world best hardware and software.

Challenges from the Internal Situation and Response Patterns

Extensive Social Obligations

China's state-owned industrial enterprises employ more than 43 million people. What makes many SOEs different from the traditional firms in the capitalist countries is that they perform the function of a "small society", guaranteeing employment, and offering housing, health, education and pension. The mix of corporate enterprises and social functions, complicated by a system of vaguely defined property rights, confounds the task of making an economic profit, and also legitimizes soft budget constraints that weaken incentives and the financial system.

One of the more crucial reforms is the transfer of pension, health, and education obligations from state enterprises to government bodies. Some municipalities are pooling payroll taxes for pension, unemployment, and health benefits. Some local authorities are taking over schools and hospitals previously run by enterprises. And some state enterprises are reducing housing subsidies by raising rents and wages (Jefferson & Singh, 1997). But such examples are the exception rather than the rule. Such changes have not

fundamentally affected the enterprises in this study. Because the government has no appropriate infrastructure for social welfare, firms such as Jingwei, that have changed their ownership structure, have one of their legs chained to these heavy social obligations while they try to run hard to win the competition race.

Restructuring

The China Daily, the first official newspaper in China, pointed out on September 22, 1999, that China's state-owned enterprises have problems in structure, layout, management systems, and operating mechanisms. It argued that because they were not competitive, they must be restructured. SOEs lacked capital and bore too many social burdens to continue basic operations. One especially alarming phenomenon was the duplicate construction, causing industrial operations in different regions of China to overlap by as much as 98 percent. Duplicated construction resulted in substandard production capabilities, insufficient factory work orders, overstocked products, and vicious price wars.

An important theme of the Fifteenth National Congress of the Chinese People's Congress (CPC) was further reform of SOEs. Jiang Zemin, the President of the state, appealed to members to find practical forms of public ownership which could stimulate productivity and improved operational methods, with organizational forms reflecting the laws of socialized production. The criteria for assessing the ownership structure had been put forward by Deng Xiaoping, the state president after Mao, in 1992: "whether it promotes the growth of productive forces in a socialist society, increases the overall

strength of the socialist state and raises living standards." The shareholding system was considered a form of public ownership that could facilitate the development of productive forces.

The introduction of the shareholding system among SOEs was nothing new. Shunde city in Guangdong, for example, began to reform the ownership structure of enterprises owned by its towns and higher levels of administrative units in 1992, and completed the process in just over three years. All these enterprises eventually adopted a shareholding or shareholding-cooperative system. The CPC's endorsement, however, was essential in providing the ideological foundation and therefore the legitimacy for this line of reform.

In early 1990s, structural weaknesses plague all of China's SOEs: a large number of small factories, backward technology, and an inability to develop new products. Today, SOEs are in different stages of economic reform.

Chongqing CHN & CHN Ceramics Co., Ltd.

Chongqing CHN & CHN Ceramics Co., Ltd. is the pioneer in innovation. It changed its structure to a joint venture enterprise as early as 1993, and adopted restructuring measures to improve its ability to develop new technology and increase production capacity. It enjoyed first mover benefits: tax cuts from both the state and local governments, the ability to purchase the most advanced manufacturing hardware from Germany, financial autonomy in paying higher wages to attract and keep the best people in the industry, and the ability to develop the effective CIMS software for functionality

integration. Currently, Chongqing CHN & CHN Ceramics Co. has achieved the leadership position in ceramics in the global market.

Jingwei Textile Machinery Co., Ltd.

Jingwei Textile Machinery Co., Ltd. changed its ownership structure in 1996, when it issued stock to the public, and gathered enough funds for product research, development and innovation. In May 2000, Jingwei was able to issue stock for the second time to finance its strategic actions.

Strategic asset restructuring is one of the core actions enabling Jingwei to be a competent organization. Many firms spun off some of their units along the value chain, attempting to focus on their core competence. But Jingwei adopted a related diversification strategy. In the past, the textile machinery made in Jingwei could only produce fine cotton yarn, which is the last of five cotton processes. Now Jingwei can provide a complete set of high quality machines for cotton processing. Jingwei combined the advantages of different assets and optimized the operation. Jingwei has now taken the lead in its industry.

Because of its financial capability Jingwei was able to develop advanced CIMS, which few companies in China have. The integration of information processing, and research and development capability provides competitive advantage to Jingwei and increased the firm's capability to respond quickly to market demand.

Beijing No. 1 Machine Tool Plant

Beijing No. 1 Machine Tool Plant's improper structure manifested itself in two ways. First, the plant owns everything in its value chain, from casting, forging, and machining

to assembly. The plant is big and comprehensive without any distinctive competence. Second, the plant has to take care of responsibilities for its society, i.e. BYJC has to run primary and secondary schools, dinning rooms, repairs residential houses for its workers, and manages affairs for residential areas.

BYJC's restructuring efforts started with plans to spin off those subsidiaries that are not strategically important to BYJC, such as casting, forging and machining in order to focus technology on core functions such as R&D department, sales department, assembly department and manufacturing departments.

Laying off employees is another measure taken to change the organizational structure. Since 1993, the employees have been cut from 9,700 to 4,000. Employment levels will be further reduced to 2,000 after the restructuring, which is expected to be complete in 2002. Having completed the restructuring, the plant will form a relationship with its employees based on contracts. The plant will pay a certain amount of money for its employees' medical insurance and pension benefits, but the other social responsibilities will be shifted to the society.

Right now, BYJC is actively seeking a foreign partner to form a joint venture. Its long-term goal is a group enterprise of public ownership. At present, BYJC plans to use the money from selling its land to finance the organizational restructuring and business expansion.

China Huajing Electronics Group Corporation

China Huajing Electronics Group Corporation realized that without fundamental transformation it would not survive long in the market. To achieve the goal of turning

Huajing into a competitive modern enterprise group, Huajing's first step was to change the Huajing's ownership system. With the help of the central government, Huajing was able to change its affiliation from the Electronics Ministry in Beijing to the local Wuxi Municipality, which provides a favorable operational environment through its local policies. Huajing will be controlled by the Wuxi Asset Management Company, which consisted of the Wuxi State Asset Committee and creditor Banks. With the help of Wuxi Government, Huajing planned to get rid of its social institutions such as Huajing Elementary School, hospital, kindergarten, community committees, and Estate Company. This alone could save 3.4 million *yuan* per year.

The modern enterprise system will be used once the system transformation is completed. The organization will be run strictly according to the state Corporate Law and Firm Regulations. Power and responsibilities of the stockholders, board of director, supervision committee and management will be clearly specified so that owners, managers and producers will know their roles in the organization. The government no longer makes decisions for the organization, and instead plays its role through its representation on the board.

The third step is through asset restructuring and system transformation, specifying the right internal relationship between Huajing headquarters and its subsidiaries according to the requirements of the modern corporate system with clear definition of ownership, authority, and responsibility.

Harbin Electric Machinery Co., Ltd.

Harbin Electric Machinery Co., Ltd. went through a company-wide restructuring in October 1994, that separated the social responsibilities such as hospital, schools, kindergartens, etc. from HEC. At that time, HEC had 12,500 people, and 2,500 were spin off to establish the Harbin Electric Enterprise Development Co., Ltd. The major purpose of restructuring at that time was to get its stock issued to the public in Hong Kong. It has been more than seven years since the restructuring, but HEC is still responsible for financing its social responsibility. Every year, HEC has to allocate about 60 to 70 million *yuan* to those separated units. In fact, the restructuring was only a matter of packaging the company for the outside world, and did not change operations.

Sichuan Chemical Works (Group), Ltd.

Sichuan Chemical Works (Group), Ltd. growth strategy focuses on related diversification of its products to adapt to ecologic agriculture in China and to withstand the impact of market competition. The company implements this strategy through joint ventures with foreign partners from Norway, Japan, and other regions. In reality, the company has not adopted any real measures to fundamentally change its organizational structure. Till September 2000, the company never spun off any of its unrelated social units or laid off any unnecessary employees. Their guiding principle is to perfect management of the group and reduce costs.

On September 8, 2000, SCW issued 13,000 shares of stocks in the Chinese stock market, which was strictly controlled by the government. The accumulated money is used to support its growth strategy of changing the product structure and to develop fine

and specialty chemical products to improve the product variety and quality to meet the market demand. The shares outstanding make up a very small portion of the ownership of the group. Because the shareholders are scattered all over the country, they are unlikely to play any significant role in influencing the long-term strategy of the group.

The results of response to the insufficient structure established under the central planned system for the six SOEs included here exhibited three forms: 1) changes in organizational structure and attempts to build capable organizations with core competences such as CHN & CHN and Jingwei; 2) changes in organizational structure so that each strategic business unit could stand on its own either to increase its working efficiency and generate more profit, or to stop the organization from losing money, as in the cases of SWC and Huajing; and 3) to repackage the organization for stock issuance, such as HEC.

Building A Capable Organization

Building a capable organization is a new concept for most SOEs. Under China's central planning economic system, firms had similar operations. The major responsibility for firm managers was to implement the strategies molded by the central government. China was run like an enormous company. Competition for markets, products, or prices was not allowed. Resources, including people, capital, and natural resources were allocated in accordance with the national strategic intent. Managers were not encouraged to differentiate themselves in terms of managerial competences, technological innovations,

product offering or branding. There were almost no economic incentives for managers' long-term or short-term performance.

In 1992, China formally announced the establishment of the socialist economic system, within which enterprises were required to change their sole dependence on the government to a dual dependence on the government and on the market, and gradually create the capability to compete in the marketplace. Since then, the state has lifted step by step the government protection for domestic firms from the competition of foreign firms, and meanwhile encourages entry of private-owned enterprises, joint ventures, and foreign-owned companies.

Facing multiple challenges in the external environment, the six firms in this study came to realize that survival depended on the firms' capabilities: the skills, assets and relationships that companies assemble to build competitive edge.

Integrative Management Capability

Four of the study firms, Beijing No. 1 Machine Tool Plant, Chongqing CHN & CHN Ceramics Co., Ltd. Jingwei Textile Machinery Co., Ltd., and Harbin Electric Machinery Co., Ltd. have implemented a Computer Integrated Manufacturing System (CIMS) to integrate information technology and modern management methods with manufacturing technology. CIMS changed all operational processes, including design, computer-aided process planning, product data management, simulation databases, inventor-user interactions, rapid 3-D "virtual" prototyping, and computer-aided manufacturing. CIMS process and resource optimization improved their TQCS (time to market, quality, cost and service). CIMS was applied to product development to integrate

technology and tools to reduce development time. The integration of the information for product manufacturing has drastically improved the management and production efficiency.

The concept of contemporary integrated manufacturing is very useful and helpful for Chinese enterprises in improving their positions in competition. The integration capability, including process re-engineering, and optimization (concurrent engineering), resource optimization between enterprises (agile manufacturing) are concrete and comprehensive ways to enhance enterprise competitive ability. CIMS has made it possible for these firms to create interactions among their functionalities, thus leading to deeply embedded synergy (Werther & Jeffrey, 1995). For example, CIMS provides the central vehicle enabling inventor-user interactions, rapid distribution of products, and market feedback that add most value to product innovations. It allows multidisciplinary (marketing-manufacturing-development) teams to interact continuously with customers all over the world, capturing their responses through video, audio, physical sensing, and computer network systems. Such customer participation is a crucial element in both lowering risks and enhancing the customer value of designs. These unique advantages are unavailable to other firms in the industry, and it will take several years for other firms in the industry to acquire this capability.

Technological innovation Capability

Technological innovation can reshape the competitive landscape of an entire industry with astonishing speed. Some businesses may fail to bridge the discontinuity and wither away, while a few innovators with novel concepts or methods rise to dominance. Firms

investigated in this study, though in different industries, exhibited similar patterns of transformation when a new product or process technology emerged to challenge old formats. A close look at Beijing No. 1 Machine Tool Plant, Chongqing CHN & CHN Ceramics Co., Ltd., Jingwei Textile Machinery Co., Ltd. and Harbin Electric Machinery Co., Ltd. reveals that innovation has been the key to success and helps identify the qualities that determine whether a firm will survive the encounter with dramatic technological change.

Shift from Product to Process Innovation.

As producers and customers agree to product features, and as markets expand, a shift takes place in the rate at which product and process innovations occur. Although the companies in this study never stopped innovating their products, computer numerical controlled (CNC) machines provided a major shift early on from product to process innovation. In general, this shift took place when CIMS was used to help the integration of engineering design and manufacturing to achieve the agility capability. Beijing No. 1 Machine Tool Plant, Chongqing CHN & CHN Ceramics Co., Ltd., Jingwei Textile Machinery Co., Ltd. and Harbin Electric Machinery Co., Ltd. made great efforts to improve their manufacturing processes.

Dual Focus on Cost and Quality.

It was every firm's strategy to consider cost, both in the design of the product and in the process that would manufacture it. Beijing No. 1 Machine Tool Plant and Jingwei Textile Machinery Co., for instance, have tried their utmost to replace their original manufacturing machines with CNC machinery because the former had high operational

cost and made low-quality products. Today, many believe that about 70 percent of manufacturing costs are dictated by product design, which was one of the driving forces for four of our study firms to invest heavily into CIMS.

Brands and Reputation.

Achieving operational excellence for premium products with supreme quality does not guarantee success in both the Chinese and international marketplace. A well-known brand name and the company reputation are required in modern society due to rapid communication and news media coverage. A brand name is the part that can be vocalized for the company reputation, and the reputation, in turn, will reinforce customer loyalty to its brand. Therefore companies need this privileged invisible asset as a springboard to gain more global market share. Chongqing CHN & CHN Ceramics Co., Ltd. has taken the lead in its industry in this endeavor, and CHN & CHN is the brand name created and nurtured for this purpose.

China Huajing Electronics Group Corporation, Beijing No. 1 Machine Tool Plant. Sichuan Chemical Works (Group), Jingwei Textile Machinery Co., Ltd. and Harbin Electric Machinery Co., Ltd. also identify the significance of brand name and reputation for their customer awareness and firm growth, and are all in the process of creating reputations for their brand named products. But it takes years of consistent efforts and super market performance before these firms will enjoy this privileged asset as their distinctive competence, while other Chinese firms start to realize the importance of this strategic marketing concept.

Customer information.

Detailed information of all kinds can be critical to maximizing sales. Some of the most valuable information involves customers' buying habits and needs. CIMS information at BYJC, CHN & CHN, HEC, and Jingwei helped to ensure that these companies have the right product mix for their customers. They try to extract a range of data from each sale. The information is downloaded daily from computer terminals to headquarters, where sales trends are analyzed. Every day, managers can gain access to current and historical data to adjust and customize the product mix to satisfy the never-ending quest for the optimal product mix for their customers. CIMS Information Databases can also generate information for total industry unit sales of the previous period, its growth rate, and the percentage of a market segment of total industry, which help managers to make more accurate predictions for the production plan for the next period, and sales and promotion budgets can be made accordingly.

Special Relationships.

One of the most important yet least-discussed capabilities involved relationships. Ties with existing customers and suppliers provide growth opportunities and should be nurtured. Those with powerful individuals, businesses, and governments can unlock opportunities that would otherwise be shut off. In particular, relationships can facilitate entry into new industries and geographies, as well as bring deals to the table. This is true, particularly in the countries without a stable legal and regulatory environment, or countries that are undergoing drastic social change or transformations, such as the case in China. Chinese usually use the word *guanxi* to refer to the connections, contacts, and

personal relationships needed to do business in the markets. For the last few years, U.S. press reports on questionable campaign contributions from Asian companies and individuals have been equating the word "*guanxi*" with bribery and corruption. Businessmen and investors need the right local contacts and connections to do business in these relationship-oriented business cultures. But developing those vital connections need not involve illegal payments, and there is no necessary linkage between *guanxi* and corruption.

In China, *guanxi* does not carry negative connotations (Xin & Pearce, 1996). To managers, it is the social network for information and mutual help. Luo Yadong (1997) concluded in his study "*guanxi*-based business variables are significantly and positively related to firm's accounting and market performance", and he explained that sales force marketing and credit-granting decisions based on *guanxi* are found to have a systematic and favorable effect on firm's profitability, asset turnover, and domestic sales growth.

When talking about the relationship between the firm and the government, Xu, Juyan, member of Chinese Academy of Engineering; Senior Advisor to China Huajing Electronics Group Corporation, and Honorary Director to China Huajing Central Research Institute commented that some senior executives have misconceptions about relationships with the government. Because the government officials used to interfere with the firms' decisions, these senior executives try to avoid communicating with government departments. "This is a wrong attitude" he criticized. It is the central planning system that imposed government's fingers in all the matters of the firm. Now

they try to help if they can, and firms will miss many opportunities when they cut short the communication channel with the government.

All the firms in this study cultivated and nurtured good relationship with government and leaders at various levels. Chongqing CHN & CHN Ceramics Co., Ltd. obtained development funds from building this channel of trust. Wuxi government has provided China Huajing Electronics Group Corporation favorable policy and support for its growth. It has created Wuxi Electronic Industry Park specifically for Huajing, where Huajing has the opportunity to develop into a conglomerate in its industry. Beijing No. 1 Machine Tool Plant has worked closely with Beijing municipality government in moving from the central city into an industry park, obtaining a large amount of funding for its facility modernization and process innovation. Help from various sources played a significant role in issuing stock for Sichuan Chemical Works (Group), who was in desperate need of capital for product restructuring and facility upgrading. One of the major reasons Jingwei Textile Machinery Co., Ltd. moved its headquarters to Beijing was to have direct connections within this important governmental and social network. Harbin Electric Machinery Co., Ltd. needs help from government to remove its social obligations, even though these social units have been separated from its organizational structure.

CHAPTER XI. CONCLUSIONS AND IMPLICATIONS

This dissertation focuses on Strategic Challenges, Strategic Responses, and Strategies for China SOEs that face significant challenges from a nation-wide economic transformation towards a market economy, from rapid globalization, and from increasing industrial competition. This research has identified the dominant challenges and forces for change in China, the nature of SOE responses to those forces, and SOE performance in making the necessary transformations to compete in a global business environment. It was assumed that the purpose of China's reforms was to create modern, competitive corporations. The research described the objectives for SOE reforms and resulting development in 1) revising strategic direction and structure, 2) responding to a changing market and competitive environment, 3) establishing modern corporate systems, 4) improving economic performance, and 5) strengthening the capacity of scientific and technological development.

The rationale for defining the research question is the same as in hypothesis-testing research (Eisenhardt, 1989). Specifically, the following five questions were explored and examined in this dissertation research. 1) What factors create strategic challenges to SOEs? 2) How have SOEs responded to a more market driven environment? 3) What factors determine the strategies of SOEs? 4) What new business processes and structures have SOEs planned and implemented? 5) How do these SOEs measure performance of their new strategies?

The investigation was carried out using case study methodology. Eight companies in seven industries were studied, and six were described in this dissertation. Two of the cases lacked adequate data to complete their analysis. Open-ended interviews, covering the research questions, were employed when talking to CEOs. Respondents were asked for facts to support their comments, as well as providing opinions about events. CEOs' insights helped to form propositions as the basis for modifying further inquiry and directing company research.

Semi-structured interviews were conducted with officials at each SOE regarding 1) how they perceived challenges both from the external environment and internal situations; 2) how they successfully initiated strategic change; 3) how they achieved their goals in terms of developing competitive product development, and 4) how they had changed their policies and procedures to achieve the fit between structure and strategy. People designated in this semi-structured interview were managers from departments of technology, HR, production, marketing, and strategic planning. These executives had first hand experience in developing new strategies and implementing change. Information accuracy was achieved by probing for the details on issues presented by the CEOs. Individually, each firm was written up as a research case study, and collectively, a model of strategic transformation of Chinese SOEs was developed.

Conclusions

Conclusions were drawn about how these SOEs were changing their strategies, structure, policies and procedures to deal with changes in the Chinese industry and competitive pressure from the international arena in preparation for China's entry into the WTO.

Lessons from these companies will be relevant to other SOEs facing similar forces of change and challenge. The results are intended to be helpful to managers, researches, and policy makers.

The Challenge-Response Model for China's SOEs

A modified model for SOE study has been developed (Figure 12) from the conceptual framework for this dissertation (Figure 3) based on the framework derived from Hofer's (1973) preliminary research (Figure 1). This model, which is built on the concept of business strategy, summarizes the findings of this study, and has proved to be an effective analytic tool in studying the patterns of strategic behaviors of SOEs in responding to China's dynamic economic, social and industrial transformations. The major contribution of this model is that it takes the holistic view, and studies the development trends in strategic behaviors at a macro level. Even though the variables in the model change and their significance can vary according to stages of the life cycle for change, the model provides theoretical guidance in research of emerging economies, and catches the dynamics of change. The beauty of this model lies in its simplicity in logic flow and practicality in application.

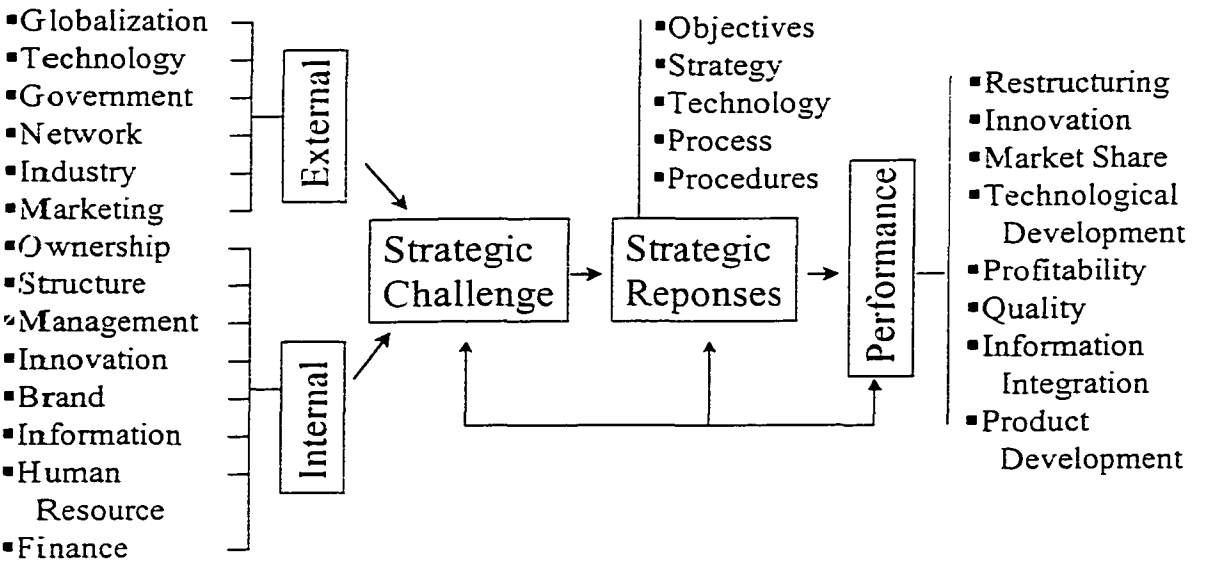


Figure 12. Holistic Model for Strategic Challenge-Response for SOEs

Strategic Challenges to SOEs

The model begins with strategic challenges to SOEs, which was the initial research question of this dissertation. Most of the findings of the model in the external environment were consistent with the findings of previous researchers studying emerging economies (e.g. Child & Lu, 1996; Hoskisson, Eden, Lau & Wright, 2000; Kornai, 1986; Lee & Miller, 1996; Peng & Heath, 1996; Soulsby & Clark, 1996). These variables included a) globalization, b) technology, c) institution such as government regulation and infrastructure, c) network, and d) industry challenges.

Globalization. The globalization of markets equates to the globalization of competition. With greater market exposure comes intensified competition, diminishing market dominance by state-owned enterprises, accelerated product life cycles, and deepening performance uncertainty. As China opens itself to the global marketplace, most SOEs, unable to rely on patronage or position for protection, are permanently vulnerable. The scale of global opportunities, the complexity of the competitive arena, and the relentless performance discipline imposed by the capital markets are forcing these companies to either specialize and become world class and world scale in their chosen field, or exit the business. International accords in preparation for China's membership in the WTO are opening more markets and expanding access to existing ones, fostering competition, and bringing consumers more choices of higher quality goods and services at lower prices. By opening China to these global opportunities and threats, its state-owned enterprises have been forced to develop strategies and structures that will allow them to survive. As membership in the WTO nears, the time available for making decisions shrinks.

Technology. One major driving force that has made the globalization a reality is technology. The world has entered a new epoch, in which technology is developing at an extremely rapid pace. Technology is also the engine of economic growth. It underpins China's fastest growing industries, provides the tools needed to compete in every business, and drives growth in every major market segment. Technology is transforming the very basis of Chinese competition, enabling large businesses to perform high-quality design, and manufacturing work, while achieving the speed, flexibility, and closeness to customers that were once the sole domain of smaller firms. Technology provides the

tools for creating a spectacular array of new products and new services. Advances in technology has spurred SOEs' growth and creation of core competencies, facilitated the conduct of business worldwide, and accelerated the development of new products, services, and capabilities. With such technology, SOEs can respond quickly and flexibly to ever changing global market demands with high-quality, customized goods and services at competitive prices. Therefore, technological leadership often means the difference between success and failure in the global marketplace for companies.

Government. The government is now separating some commercial activities from government bureaus, though not yet complete. The government could no longer afford the inefficiencies and losses financed explicitly through banking or budgetary systems. Redefining government functions is viewed both as a prerequisite and a logical consequence of such reforms of state enterprises. The thrust of economic restructuring is to separate government from enterprises and the promotion of a "small government, big society." The latter implies that all levels of government should limit their functions and allow people to acquire the goods and services they want from the market. Firms in China are facing institutional problems, largely from a less developed enterprise environment, an inefficient capital market, and incompleteness of the social security system.

Social Network. Social network is one of the most important yet least-discussed variables in China, which is undergoing drastic social, economical and industrial change and transformations, and has not yet created a stable legal and regulatory environment. Ties with existing customers and suppliers provide growth opportunities and should be

nurtured. Those with powerful individual, business, and government networks can unlock opportunities that would otherwise be shut off. In particular, a strong customer network has a systematic and favorable effect on firm's profitability, asset turnover, and domestic sales growth. Strong government networks are also essential to carry out significant SOE transformations.

Industry Competition. The industry competition came from three sources: 1) China's open door policy, and its establishment of 14 special economic zones to facilitate the rapid expansion of trade and foreign investment; 2) China's rural reforms that led to the rapid agricultural productivity improvements that in turn generated a rural labor surplus and ballooning rural savings that spurred the rapid entry and growth of new rural enterprises; and 3) China's "cold-war" policy of duplicating state-owned production capabilities and operations in most provinces in case of war had created a ready-made source of competition.

The challenging forces from organizational internal situations identified in this study include restructuring ownership of the firm and company structure, managerial capabilities, innovation, brand and reputation, information integration, human resources management and finance.

Organizational Ownership and Structure. China's SOEs perform the functions of a "small society", guaranteeing employment, and offering housing, health, education, and pension. The mix of corporate enterprises and social functions, complicated by a system of vaguely defined property rights, confounds the task of making an economic profit, and also legitimizes soft budget constraints that weaken incentives and the financial system.

One of the more crucial reforms is the transfer of pension, health, and education obligations from state enterprises to government bodies. Another inherent deficiency of China's SOEs rests with organizational structure, layout, management systems, and operating mechanisms.

Management Capability. Management capability of integrating information technology and modern management methods with manufacturing technology provided SOEs a great competitive edge in market competition. This management capability changed all operational processes, including engineering design, computer-aided process planning, product data management, simulation databases, inventor-user interactions, and computer-aided manufacturing. The process and resource optimization greatly improved an organization's time to market, quality, cost and service. In addition, the integration of the information for product manufacturing has drastically improved the management and production efficiency.

Innovation Capability. Technological innovation reshaped the competitive landscape of an entire industry with astonishing speed. Some businesses may fail to bridge the discontinuity and wither away, while a few innovators with novel concepts or methods rise to dominance. SOEs investigated in this study, though in different industries, exhibited similar patterns of transformation when a new product or process technology emerged to challenge old formats. Computer numerical controlled (CNC) machines provided a major shift early on from product to process innovation. In general, this shift took place when CIMS was used to help the integration of engineering design and manufacturing to achieve the agility capability.

Brand Name and Organizational Reputation. A well-known brand name and the company reputation are required in modern society due to rapid communication and news media coverage. A brand name is the part that can be vocalized for the company reputation, and the reputation, in turn, will reinforce customer loyalty to its brand. Therefore companies needed this privileged invisible asset as a springboard to gain more global market share because achieving operational excellence for premium products with supreme quality does not guarantee success in both the Chinese and international marketplace.

Customer information. Detailed customer information of all kinds can be critical to maximizing sales. Some of the most valuable information involves customers' buying habits and needs, which can help to ensure the right product mix for customers. Managers' access to current and historical data provided reliable information for making strategic decisions concerning adjusting and customizing the product mix to satisfy the never-ending quest for the optimal product mix for their customers. Information of total industry unit sales of the previous period, its growth rate, and the percentage of a market segment of total industry can help managers to make more accurate predictions for the production plan for the next period, and sales and promotion budgets can be made accordingly.

Human Resource Management. Another element in building a capable organization is the quality of their human resource (HR) support systems, including training and career planning because introducing a competitive mechanism to the HR development can make the enterprise full of dynamism. Many companies "borrow" various sources of human

resources by cooperating with research institutes and companies both at home and abroad in technical development. IBM, Procter & Gamble, Volkswagen, and others are well known in China for their training programs, and are popular employers among recent graduates. P&G, for example, runs "P&G University" for new recruits and offers training and career development opportunities abroad for top-performing Chinese employees. Several European and Japanese companies invest heavily in training local staff in China and overseas. Since HR capability building is so important, it is absolutely necessary for SOEs to employ very senior HR managers to establish China-wide policies on recruitment, compensation, training, and development. They have also had to boost their complements of recruiting and training staff in order to deal with the rapid throughput of new hires needed to offset China's high attrition rates.

Financial Capability. Highly developed financial and risk management skills enabled some SOEs to grow in ways that others could not. By crafting elegant solutions to funding constraints, some SOEs advanced along promising growth paths that are too costly or risky for their competitors. Two principles are very important to the market economy - the principle of prudence, and the emphasis on cash flow rather than just profit.

Strategic Responses to SOE Challenges

The second research question in the model addressed what factors determined the strategies of SOEs. Among the identified challenges to SOEs in this study, which impacted their strategy formulation process, were three groups of variables, including (1)

environment, (2) resource and skills, and (3) values and aspirations of top management. These three groups of variables played the most significant role in the SOE's strategy crafting.

Every organization exists within a complex network of environmental forces, and these forces are so dynamic in an emerging economy that their constant change presents a myriad of opportunities and threats or constraints to strategic managers. Organizations that master such generic growth-enabling skills as acquisition, deal structuring, financing, risk management, and capital management have a big advantage in creating and sustaining growth.

Another very significant finding of this study is that success organizations always had strong CEOs, who, in general, presided over the board of directors. Decentralization of power and internal consumption of energy resulting from diverse value systems among the top management team (TMT) would lead SOEs nowhere. The shared vision and value system among TMT members can direct the focus of attention to, and align all the resource for, targeted strategic orientation of the SOE.

The third research question studies how SOEs responded to a more market-driven environment. It has been found that while operational skills and policy procedures tended to be specific to each SOE's businesses, the growth-enabling strategies and technological innovations are transferable from one market or business unit to another. Because of their broad applicability, such capabilities usually reside in the corporate center, from where they are made available to business units. In other words, the new business processes that were planned and implemented, and the technologies acquired by

SOEs created the core competencies needed to stay competitive within the market. Continuous innovations become the driving force required for SOEs to remain ahead of the competition and better serve customers. The findings of this study indicate that all the SOEs investigated were making efforts to improve their technologies while changing the corporate structure to facilitate the strategic implementation.

SOE Performance Evaluations

The last two research questions explored the strategic approaches firms have taken and the relationship between the SOE response strategies and performance. The results of the investigation indicate that SOEs have different evaluation systems in assessing their performance because China had not standardized reporting requirements and only adopted generally accepted accounting principles in 1998. Hence, it is very difficult to compare firm performance while evaluating the results of their efforts. However, this study found that choices of performance evaluation criteria for strategic implementation have been greatly influenced by the stages of life cycle of the economic transformation.

Incremental Responses: Firms adopting incremental changes in their operation, without attempting to alter the existing structure, usually focused attention on cutting costs and improving efficiency. The strategy is to improve their management systems, not their business strategy. The long-term future for these firms is uncertain.

Strategic Responses: Firms that are busy changing their organizational structure in an attempt to restructure their businesses and free them from the central planned system swamp were concerned about completion in their strategic business units and

successfully stopped losing money. The strategic approaches commonly seen are process development, technical innovations, brand and reputation, and global market system.

Following the challenge-response-performance paradigm, we would logically expect that SOEs would adopt strategic postures consistent with their respective environments in order to achieve the strategy and environment fit, which is crucial to their survival and success. Those SOEs that have completed their restructuring and moved to compete for market positions tend to lay emphasis on market share, and product and technological innovations. SOEs that have merged in the global market have been using performance measures that are well accepted in developed countries, such as return on investment (ROI), return on equity (ROE), return on sales (ROS), return on assets (ROA), asset turnover.

Implications for Practitioners

The main purpose of this study was to examine and identify strategic challenges, responses and the consequent performance among SOEs operating under different environmental constraints. The results of this research help policy-makers in government and strategic managers in business to better understand the behavior of SOEs confronted by strong global competition, and social, economical, and industrial changes. This study found a variety of reasons for SOEs taking different approaches in strategic planning and implementation. The strategic actions taken by SOEs differed between improving efficiencies and redirecting strategies. Such actions differed according to a firm's stage of change. Policy-makers design and evaluate their strategies according to their legal environments. The institutional perspective helps to identify factors that influence

political/legal strategies. This study found that the governmental actions without the market-based adjustments did not help improve the competitiveness of SOEs, such as separating SOEs' social obligations just for packaging purposes.

Strategic managers of firms may also benefit from this study in formulating and implementing strategies that cope with industrial and global competition. Evolution of the challenge-response process would help managers understand the dynamic forces of industrial and global competition. By understanding of the nature of competition, managers can have better ideas in planning future developments to deal with competition. In most cases, the competition challenges existing "rules of the game" used by SOE incumbents. In established industries, the rules of the game are generally accepted and honored by the existing players. The "problematic nature" of competition lies in the fact that it "violates" or "bypasses" the established "rules of the game" that SOEs have been accustomed to for as long as five decades.

Strong competition reveals serious competitive weaknesses in SOEs' capabilities and structures. Managers are facing two challenges: one is to focus on organizational efficiency; the second is to change competitive strategies. Creating lean structures in a short period of time can preoccupy managers. If they bury their heads in restructuring and neglect the changes in the external environment, they can find themselves unable to compete in their businesses. Strategists should always view their long-term future so that they can align the organizational resources for the right orientation. Although implementations need careful planning and concentrated efforts, CEOs and TMT should

never be confused with too much detailed operational procedures. Forgetting to identify potential enemies is very dangerous.

The second alternative is to realign the firms' resource to building a capable organization with distinctive competencies. It is very important for SOEs to understand that the separation the nonstrategic business units and social affiliations such as school and hospitals are not immediately possible. Local governments and counties have different financial capabilities and policy priorities. This complicates the situation for SOEs.

Managers need to create an organization with skills, capabilities, and privileged assets. Global competition often leads strategic managers into a dilemma between changing product/market scope and changing distinctive competences. SOEs in most industries are inflexible in changing the product/market scope of existing businesses because the change of scope through diversification demands huge capital investments. In order to survive, SOEs must invest a considerable amount of funds for improvement of certain distinctive competences and in upgrading their technology. The findings of this research are helpful for managers to understand the problems encountered and benchmark the industry leaders.

Implications for Academic Research

This study attempted to develop a holistic model of the challenge-response behavior of Chinese SOEs involved in global competition and economic transformations. The conceptual framework was designed to reflect the dynamic nature of the challenge-response process by focusing on the research flow of challenge, perception, and response.

The central question was how to capture the dynamic aspects of challenge-response behaviors and to build a theoretical model guiding research on SOEs in a fast-changing environment.

The necessity of utilizing a dynamic approach has been clearly noted in the field of strategic management though few models have been developed to effectively deal with this problem. To this end, this study has provided a contribution by using a dynamic holistic model of strategic response behavior of SOEs facing a strategic challenge. In this study, only the strategic behaviors of industry leaders were examined because it was assumed that leaders were more heavily involved in and affected by global and industry competition. Of course, companies within the same industry but at different provinces and localities may have developed different competitive strategies in response to the strategic challenge of competition. Such variation in response strategies calls for further investigations.

Another limitation of this study relates to its sample selection of the eight industry leaders that were involved in different stages of change in their current transformations. Time and other resource limitations restricted the scope of this study to only six industries.

Further research may find that responses to the strategic challenges are influenced by factors other than those identified in this dissertation. For example, SOE relationships with the communist party system, labor unions, and customers may affect strategic responses to both external and internal challenges. Though it was not investigated in this

study, relationships with the Party system and the growth in labor unions have significantly impacted strategic responses of some firms.

Hofer [19731 provided a model of the strategic challenge-response process and some tentative conclusions about the strategic responses of firms facing various types of strategic challenges. This research applied a modified Hofer's model to SOEs facing both strong external and internal challenges. In his article, Hofer tentatively concluded that different types of strategic challenges do indeed elicit different types of strategic responses, and noted that the relative success of different possible strategic responses differed for different types of strategic challenges. The findings of this study confirmed his hypothesis, but at the same time discovered similar response patters across industries in dealing with strategic challenges. The central question of this study was to identify the pattern of responses of SOEs within different industries that confront similar strategic challenge.

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