

ENFORCING RESEARCH AND DEVELOPMENT:

-- THE IMPORTANT WAY TO GET RID OF THE CURRENT PREDICAMENTS FOR CHINESE ENTERPRISES

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ABSTRACT

Business strategy and management decision-making are of prime importance for enterprises to survive and develop in competitions. Under the new circumstances of macro economic adjustment, industrial structure adjustment, and worse operating micro economic environment in China, it especially shows overwhelming importance. The paper based on a generic S.D. model of machinery industry, discusses several problems the enterprises face, such as shortage of working capital, raw material deficiency and intensive market competition. Those problems bring many obstacles to enterprises. In the paper we explore a series of solutions concerning technological transformation and new product development. Then we suggest several alternative policies. Furthermore, the paper discusses the effects of technological transformation and new product development on Chinese enterprises under the new circumstance in the long-term.

I. Introduction

It has been ten years since China adopted the policy of reform and opening to the outside world. With the deepening of economic reforms, some adjustments are usually necessary when the economy is over hot. Now China is just in the process of adjustment.

The shortage of circulating funds, raw materials, the sluggish market and fierce competition are the common problems enterprises have to face at this stage. In the past, the state-run enterprises, especially those large and medium-sized ones, need not care about the supply of funds and raw materials secured by the state. Therefore, when the state reduces or even cancels the supplies, the enterprises have to face the complicated and changing market, and deal with the intense competition. Business strategy and management decision policies then become very important. When other enterprises are in the same troublesome situation, to lay emphasis on the study of middle and long-term strategy of the enterprise and to make business decisions in advance are the knacks to gain great progress of the enterprise in the long run. ERF is a supplier of electric equipments for power and energy industries. It is a medium-sized one and also one of the three main producers in that line in the country. For many years with the expansion of the market and state investment in power and energy industries the factory made a good record and became a "second class" enterprise.

The situation began to change in 1986. Though the production scale and output were still increasing due to the market demand,

the economic returns were going from bad to worse. The profits before taxation decreased at an annual rate of over 15% for four years. In the same time the equipments and technologies were becoming old and backward due to lack of necessary funds to improve; new products development was slowed down too. The result was the decrease of market share. What is more, working circulating funds were in short supply because of the country's tight monetary policy, which affected the smooth operation of the factory as well as the reputation among old customers due to the delay of the products delivery.

After studying of the data of the factory, we can see that the main external factors affecting the enterprises' development and economic benefits at present and in the future are as follows:

1. The total investment of the state in the power and energy industries. It decides the total demand of the market and is of vital importance for enterprises to survive and develop. From the overall tendency of the economy development and the shortage of power and energy we can expect that the state will continue to increase the investment. So the demand will increase. But the actual demand will increase slowly as the result of the general economic policy of the state and the tight monetary policy.

2. Intense market competition. The slowly increasing market limits the development of the main enterprises. The factory must pay more attention to marketing, selling groups have to go to the customers instead of staying at home waiting for them. And the old ways of post services have to be changed. It can be predicted that the selling cost will have a relatively big increase in order to guarantee the market share in fierce competition.

3. The shortage and the expensiveness of raw material. The cost of raw material makes a big part of the total cost of the product, and its influence on the benefits of the factory is serious. From 1986 to 1989, the expenses on raw materials have increased 150% while the price of products which is strictly controlled by the state only increase 20%. The proportion of cost in sales income increased from 40% to nearly 60% with the average profit decreasing from 30% to 12%. That's to say, the changes in the price of raw materials exerts a great influence.

4. The loan policy of the state

The monetary policy of the state is a very important factor to the factory's supply of funds since most of the working capital of the factory comes from bank loans. When the factory can not get enough money to keep the production going, it is natural that the factory's reputation and its relationship with the customers will be destroyed.

The above mentioned are some external factors that influence the business management of the factory and the factory usually can do nothing about them, especially in a short period of time. That is to say, all the business affairs have to be dealt basing on the facts mentioned above. So the only solution is to

do something to change the internal structure and functions of the factory and improve the management.

The following are some internal factors concerning benefits of the enterprises.

1. Because of the tightness of money and the lack of motivation to develop new products under the central planing economy, the enterprises are not active in technological innovation, and thus the product substitution is slow. The main reasons for that are the shortage of funds and the lack of motivation to develop new products. Facing the competitive market, factories now are more interested in the development and sales of new products in order to attract customers but the funds for that are still not adequate.

2. Technological transformation and progress

The fixed capitals of the factory underwent a great expansion in the past decade but the expansion is only in scale not in technical progress. The relatively backward technology has at least two restrictive effects on the development of the factory. One is on the raising of productivity and the production cost, and the other is on the development of new products since new products usually need advanced equipments, which means more investment in equipments.

3. Poor management and serious waste

More attention has been paid to business management in recent years. The larger the factory is, the harder it is to coordinate with the functional departments. Management problems lie in consciousness field and the sense of responsibility. The consciousness of the people changes with the progress of the time. The people's ideas change when the factory is facing trouble and crisis. This leads to a good trend to rationalize the functional structure. And the distribution of personal waste is very common in the enterprises in our country. Backward technology is one reason for that but to a great extent, it is attributed to poor management and high unit consumption of raw materials is another reason. These lead to the low economic benefits. To enforce basic management and more business reforms are the major solutions to this problem.

The above are some internal factors concerning enterprises benefits. Next we will analyze and discuss these problems using S.D. theory and methods. We will analyse the influences of the internal factors on the long term development of the factory at first, and then try to find a solution to the problems the enterprises face.

We create a model SDGMDM to aid the business decision-making. The following is a stretch drawing of the main structure of the model according to the micro business mechanism and problems to be solved.

III. The analysis of the fundamental operation

We first have a test of the basic model according to the present situation of the business operation in the factory when no extra measures are taken including R&D new product development

and technological transformation. We begin from 1989 with the collected statistic data. The result is shown in Figure 2.

The profits of the factory will drop from 5 million in 1989 to 102 million in 1999. With the prices of raw materials rising at an annual rate of 9--10% while the product price can only have a 20% rise in all. And the profit rate from capital will drop from 18% in 1989 to 6% in 1999. The factory will grow to some extent but the comprehensive production capacity will begin to decline around 1995, due to the decrease in profit from capital revenue.

But when we take into account the tight monetary policy and intense market competition, the profits and capital revenue will drop to zero. The demand will be small due to the tight monetary policy. The sales expense will increase due to the competition. These unfavorable factors lead the factory into a very difficult position.

IV. An analysis of the results of policy test

From the fundamental operation we can see that some other measures must be taken in order to achieve a great development under today's unfavorable conditions such as enforcing R&D, speeding up product innovation, strengthening the competitive ability of the factory. So we introduce the exploration of production and sales of new products into the model. According to the current cost, new products will have a rising cost of 2.5% with price rise of 60% or more.

The simulation results show that new products bring a much larger benefits to the factory. The new products make up 40% of the sales income, but the profits it makes can reach 10 million yuan and keep the rate of capital revenue at 35--40% in 1995 or so. The fixed capital can be doubled in 10 yuans. The actual production capacity may be tripled with additional technological transformation and follow-up investment. This can make the capital per capita reach a reasonable level.

Therefore enforcing R&D to strengthen new product development is a way out. It is worth while to have a further study of its effects and potentiality.

The following are some typical policy tests.

1. The prices of raw materials rise at 9.6% annually; The factory can get 50% of the capital it needs from banks; The monthly investment in R&D and new product development is 15.000 because of the fierce competition, and the insane capital has to be used in 8 million yuans from 1989 to 30% in 1994. Then it will drop again because of the accumulation of price rises in the past years. In the same time the rate of capital revenue will also drop from 60% in 1989 to 30% in 1994. The fixed capital have been doubled and the annual production capacity tripled.

The new products make 40% of the total production in 1990, it will reach 60-70% 3 or 4 years later. So we can see that the tight monetary policy has more effects on the old products which cost more and take more time to produce. Although funds are still in short supply, the factory is in a better situation just because of the introduction of new products. That shows that, facing the above problems the factories at least have a way to

overcome the troubles ensuring a continuous and lasting development, that is to invest more in R&D, change the products structure as soon as possible so as to gain a relatively superior position in the market.

2. The conditions are the same as item 1 with an extra market competition being introduced. A relative competition index is referred to as we take 1.5 is assumed for it in the test, and the result is shown in Figure 3.

The result shows that between 90--94. The factory gains some superiority in the market, the capital revenue rate rises and then remains at 46% or so. The annual profit gradually reaches 40 million yuan gradually although the sales expense rises due to the competition.

But after 1994 the profits will drop and in 1999 fall to 2 million yuan because the prices of raw materials will rise while the prices of the products can not catch up with it. This indicates that the price-rising of the materials must be controlled macroscopically. To keep a rational ratio between the price of products and the price of materials is not just for the interest of enterprises but also for the fundamental interest of the country.

3. The conditions are the same with Test 2 and the new products of the opponent factories increase at 10% annually.

The increase of new products of other factories may reduce the orders and production of the factory especially when the money is in short supply and the market is in fierce competition. The new products show their vital importance. The result see Figure 3.

The result shows that during the first 5 years the annual profit of the factory will drop slightly, remaining around 3 million yuan, capital revenue rate keeps at about 40% in the first 3 years while in the later two years at about 25% due to the competition of other new products. Between 1996--1999 the capital revenue rate will keep at 20%. But owing to the uncontrolled expense in raw materials the accumulative effects of the opponent factories on new products and the rise in management overhead, the actual profit will drop to zero or even in deficit. It again indicates that although R&D and new product development may bring good results even under the compound effects of some unfavorable factors, if the price rises in raw materials are not shown in the price of products, the problem will not be able to be solved thoroughly.

4. Comprehensive test

After a careful study of the above tests, we propose a plan which includes some possible measures. The following policies are supposed in the test.

- The annual price rise of raw materials is 9.6%
- Technological and management measures are taken to reduce 10% of the unit consumption of raw materials.
- Production period for old products decreases by 20%, for new product by 15%
- 60% of the capital the factory needs is ensured
- New products of opponent factories increase 10% annually

The result of the test is in Figure 4.

The result of the comprehensive test is: in the first six years the annual profits increase evenly from 20 million yuan in 1990 to 36 million yuan in 1995, keeping at 40%. In the sixth year and after, the profits and capital revenue rate will drop because the compound effects of many unfavorable factors, esp. the limits on products price adjustment capital revenue rate will drop from 40% in 1995 to 24% in 1997 and then to 12% in 1999. The profits in 1999 will be 1.2 million only.

The fixed capitals increase by 50%, and the actual production capacity increases by 100% in ten years.

The above test is a comprehensive plan including some favorable and infavorable factors. Though the result can hardly be said excellent it is realistic and easy to realize.

V. Conclusions

To summarize the tests we find that under the serious business situation, enterprises are facing many touchy problems. Since an enterprise is unable to change the external factors, it is very important for it to take some unique measures such as enforcing R&D and developing new products which we have just discussed to save the enterprise out of the troublesome state which all the other enterprises are in.

References

1. Qifan Wang, "System Dynamics", 1988, Tsing Hua University Press.
2. Qifan Wang, et al., "Theory and Application of System Dynamics", New Time Press, Beijin.
3. Jay W. Forrester, 1961, "Industrial Dynamics:", Cambridge, Mass., The MIT Press.

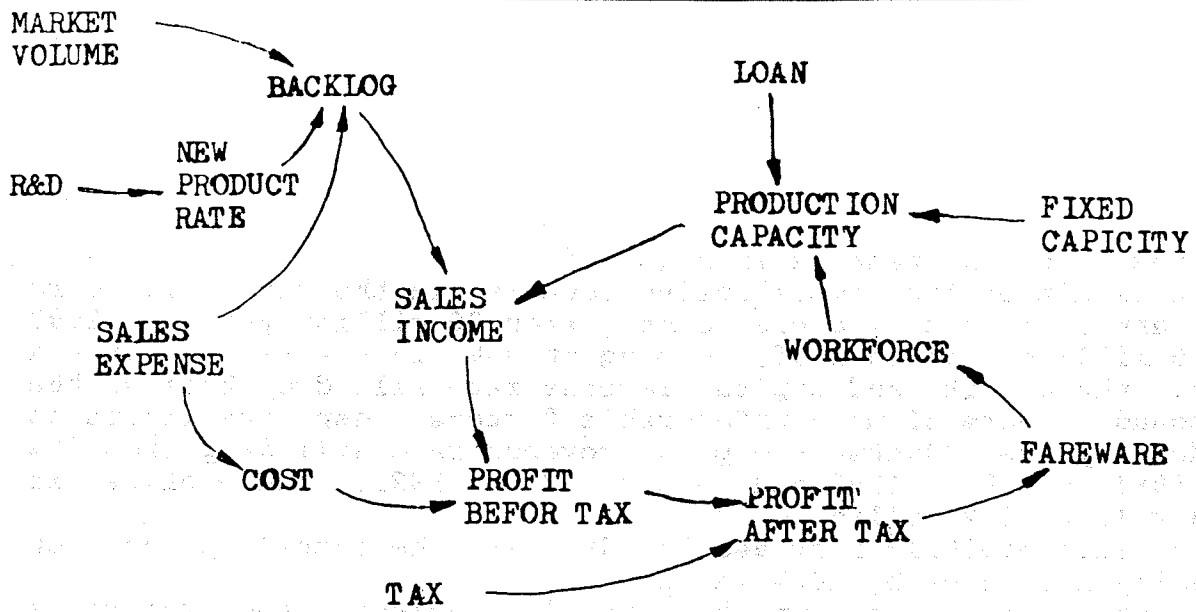


Figure 1 Basic Structure Diagram

PC
RCP
SI
PFAT

1000
40%
800
50

750
30%
600
25

500
20%
400
0

250
10%
200
-25

0
0%
0
-50

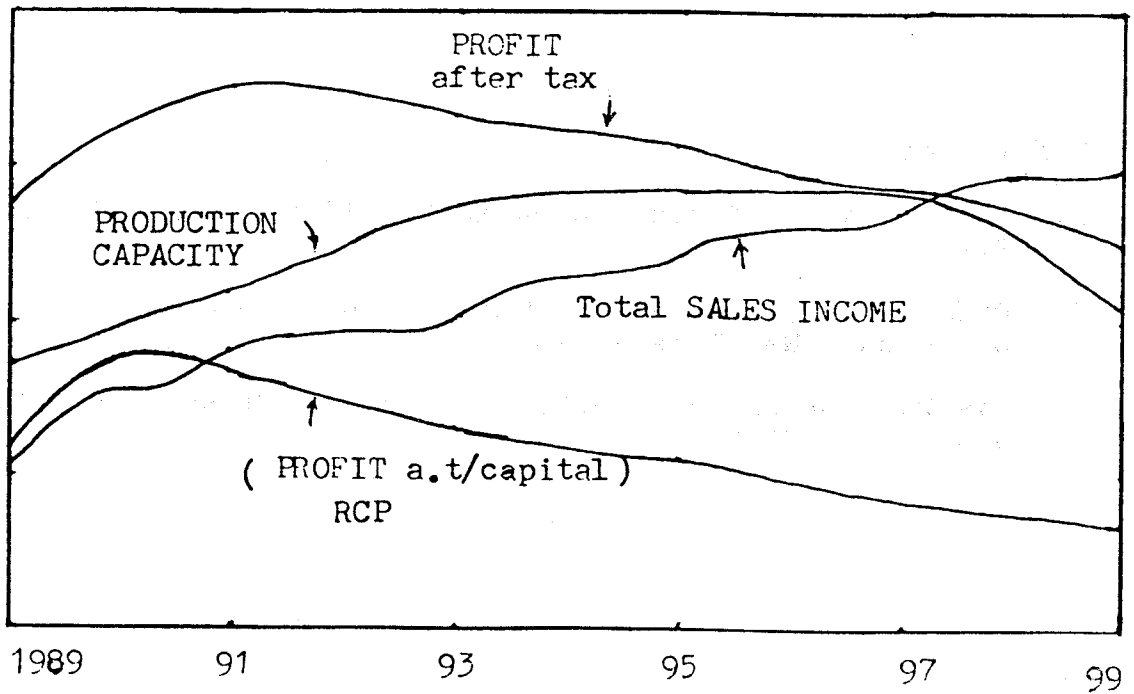


Figure 2 Model baserun

(year)

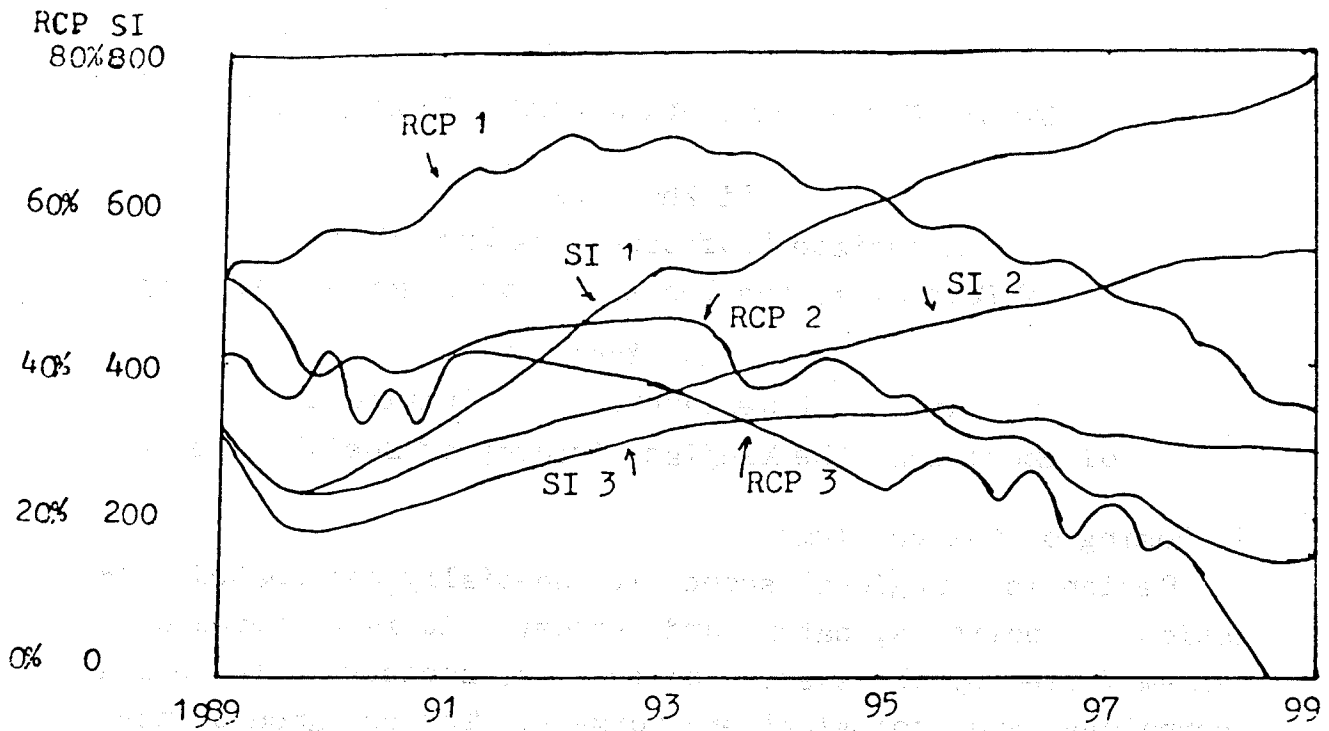


Figure 3 Policy test

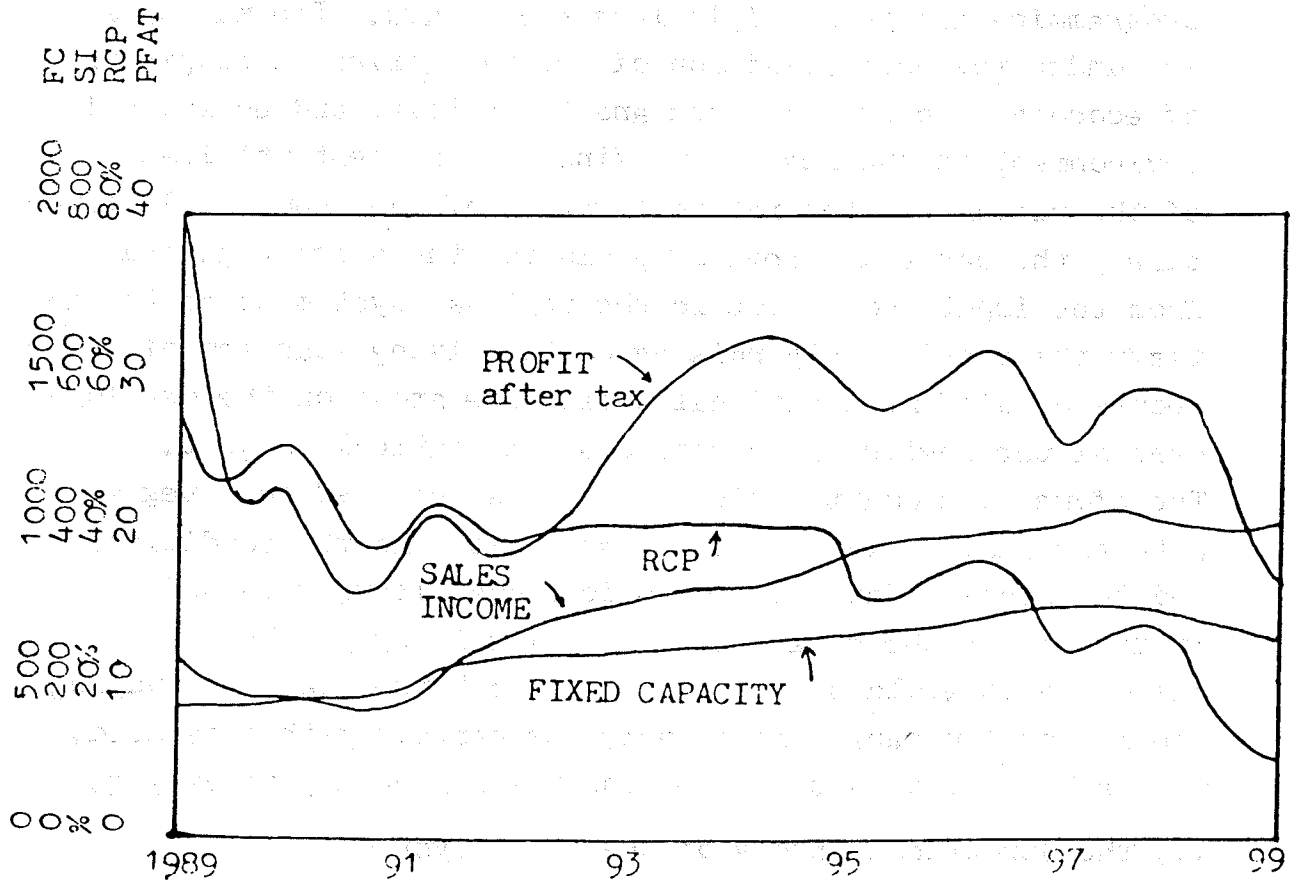


Figure 4 Comprehensive policy test