Analysis of the Development Strategy of SMIC

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Abstract: As the most advanced and largest chip foundry in mainland China, SMIC’s development strategy is of great research value and reference significance. This paper first gives a brief introduction of SMIC, including the company's development history and the current problems and challenges it faces. Then, it analyzes the strategic environment of SMIC and analyzes its external environment (PEST analysis) in terms of political, economic, policy and technological environment. Next, SMIC’s internal resources and capabilities were analyzed in terms of finance, human resources, technology and R&D capabilities, production capacity, and customer and market resources. Finally, a SWOT analysis was conducted based on the above, and strategic recommendations were made by summarizing SMIC’s strengths, weaknesses, opportunities and threats. SMIC’s current scale of development and operations are good, so it should plan more for future growth. The political, economic and social environment in mainland China has created positive support for SMIC’s development. SMIC should take this opportunity to secure its current market share while striving for more mainland markets, seeking external cooperation and, most importantly, making technological breakthroughs as soon as possible to catch up with the industry leaders.

Keywords: Chip Industry, Development Strategy, SWOT Model, IC Wafer Manufacturing, PEST Model

1. Introduction

There is a big gap between the level of the integrated circuit chip industry in mainland China and TSMC, Samsung and Intel, which are the leading companies. The development of the IC manufacturing industry to drive the overall level of the IC chip industry in mainland China has formed a consensus among experts in the domestic semiconductor industry. In line with this principle, the Chinese government and local governments have introduced many strong financial and market support policies to support and encourage the development of local IC manufacturing companies in mainland China. According to the China Semiconductor Industry Association, China’s IC industry will reach 104.53 billion yuan in sales in 2021, up 18.2% year-over-year [1]. As the most advanced and large-scale local chip foundry in mainland China, SMIC’s situation can better reflect the advantages and disadvantages faced by China’s chip foundry industry. Due to the special nature and importance of the IC manufacturing industry, many scholars have conducted in-depth research on this industry. Using the industrial innovation system analysis framework, Yang Daozhuo believes that the industrial innovation system is an effective tool to analyze the
development of China’s IC industry, consolidating the knowledge and technology base is fundamental to enhancing the international competitiveness of the IC industry, strengthening the supply of new policy tools is the engine to stimulate the dynamics of industrial policy support [2]. Based on the theory of corporate competitive strategy and the theoretical system of vertical cooperative R&D competition, Wu Jun combined the actual analysis of the value chain of the IC industry and gave the suggestion that SMIC should adopt the competitive strategy of vertical cooperative R&D in the upper and middle reaches of the corporate value chain in order to maintain a sustainable competitive advantage [3].

The research in this paper builds on the previous research approach. However, the external market environment and political environment of SMIC have changed a lot in recent years. This paper will reorganize and summarize the current situation faced by SMIC and make new predictions for future development strategies. This paper is divided into several sections around the research topic. To explore and analyze the competitive advantages and disadvantages of the enterprise, firstly, we deeply analyze the development background of SMIC. Secondly, based on the existing research method of enterprise strategy theory, PEST model, this paper analyzes the political, social, economic as well as technological macro environment of the industry in which SMIC is located. Then, it analyzes the micro-environment. Finally, based on the above contents, the author draws a SWOT table and summarizes the strategic recommendations based on the above. It is the purpose of this paper to provide a feasible competitive strategy for SMIC’s development.

2. Company Profile

Founded in 2000, SMIC has become one of the world’s leading IC foundries in a short period of time, providing foundry and technology services to customers worldwide at various technology nodes from 0.35 microns to 14 nanometers. According to IC Insights’ 2021 global market sales ranking for the pure-play foundry industry, SMIC is ranked fourth in the world and first among mainland Chinese companies. Its shareholding structure has changed over time. As of December 31, 2021, in addition to the 56.74% of shares held by HKSCC, the largest shareholder of SMIC is Datang Holdings Enterprises Co. (1.61%). Ltd. is wholly owned by China Information and Communication Technology Group Corporation, a central enterprise in China. It effectively holds 11.7% of the total issued share capital. It is wholly owned by China Integrated Circuit Industry Investment Fund, and therefore the actual holding of ordinary shares by China Integrated Circuit Industry Investment Fund Co. [4].

3. PEST Analysis of the External Environment of the Enterprise

“PEST” model analysis is a thinking framework. This framework mainly includes four main external macro environmental factors: politics, economy, society and technology. The key to the analysis is to determine the specific factors that affect the enterprise strategy and operation under the above four dimensions.

3.1. Political Environment Analysis

The IC and software industries are at the heart of the information industry and will be the driving forces behind the next round of technological and industrial change. China has elevated the development of the IC industry to a national strategic level and fully supports and promotes the leapfrogging development of the IC industry. The government has actively issued policies in terms of development strategies, development goals and financial subsidies to create a favorable policy environment for the development of the IC industry. In August 2020, the State Council issued the “Several Policies for Promoting High-Quality Development of Integrated Circuit Industry and
Software Industry in the New Era” to increase support for the local IC industry [5]. In March 2022, the National Development and Reform Commission and other five departments jointly issued the “Notice on the requirements for the formulation of the list of IC enterprises or projects and software enterprises to enjoy preferential tax policies in 2022”, which provides import tax benefits to enterprises related to IC production [6]. The National IC Industry Development Promotion Program is a planning and guiding role for the development of China's IC industry. Since the launch of the outline, the industry has seen significant growth in sales revenue year by year. The next goal established is to make the major links of the mainland IC industry chain reach the international advanced level and enter the first echelon by 2030 [7].

3.2. Economic Environment Analysis

From a domestic perspective, a series of favorable measures such as tax breaks and loans for the IC industry in China have attracted a lot of capital to IC-related companies. For example, the Ministry of Industry and Information Technology announced the establishment of the National IC Industry Investment Fund (NIIF) to guide and leverage private capital to gather in the IC industry. The National IC Industry Investment Fund is sponsored by China Development Financial, China Tobacco, Yizhuang State Investment, etc. The first phase raised 138.7 billion RMB. [8]. The second phase of the National IC Investment Fund is in the investment stage, the data is incomplete, but it is predictable that the investment scale of the second phase is larger than the first phase. The registered capital of the second phase of the fund is 204.1 billion yuan, which is expected to drive the follow-on social capital close to a trillion [9]. From an international perspective, the impact of global integration and economic integration on China’s economy is enormous. Trade barriers launched by different countries under different names can affect the import and export of Chinese enterprises. For example, technical barriers, anti-dumping barriers, quarantine barriers, etc. The Wassenaar Agreement provides for strict controls on the export of sensitive military and dual-use technologies and other high-technology products to developing countries by countries such as the United States, the United Kingdom, and Japan [10].

3.3. Social Environment Analysis

Several Policies to Promote High-Quality Development of IC Industry and Software Industry in the New Era was publicly released in July 2020. In these policies, the government has exempted some local IC enterprises from corporate income tax; improved the investment and financing environment for enterprises; and developed and released eight policies in the areas of finance and taxation, investment and financing, research and development, import and export, talents, intellectual property, market application, and international cooperation to further optimize the development environment of the IC industry and software industry, intensify international cooperation, and improve the industry’s innovation capability and development quality. Continue to enhance the institutional framework, support the growth of the IC and software sectors, and actively nurture IC and software-related businesses. Strengthen the construction of IC and software majors, accelerate the establishment of first-level disciplines of IC, and support the development of the integration of industry and education [11].

3.4. Technical Environment Analysis

According to EAR Section 744.11(b) of the U.S. End User Review Committee, an entity may be added to the entity list if it has been involved in, or poses a significant risk of being involved in, activities contrary to the national security or foreign policy interests of the United States based on specific and articulated facts, as well as activities on behalf of such entities. The EAR has added
Semiconductor Manufacturing International Corporation to the Entity List because it has determined that China’s civil-military integration doctrine and activities between SMIC and entities of concern in the Chinese military-industrial complex exist. The entity designation limits SMIC’s ability to access certain U.S. technologies and requires exporters, re-exporters and domestic transferors of such technologies to apply for licenses to sell to the company. Items specific to semiconductors producing advanced technology nodes at or 10 nanometers are presumptively denied to prevent such key enabling technologies from supporting China's military modernization efforts [12]. In addition, according to the IEEC international semiconductor technology route can be seen TSMC and Samsung’s technology process in 2022 to reach the level of 3nm, representing the most advanced level of integrated circuits. Intel uses EUV lithography can reach 7nm process [13].

4. Risks Enterprises Facing and Means of Response

4.1. R&D and Technology Upgrade Iteration Risk

SMIC provides foundry and technology services at various technology nodes from 0.35 micron to 14 nanometers. 10,057 patents were granted in China in 2021, a 12% increase over the previous year. By the end of 2021, SMIC has filed 17,980 patents and granted 12,467 patents [4]. However, it is a big challenge for SMIC to break through the 10nm technology node.

The IC foundry industry is a technology-intensive industry. If the company does not continue to innovate and breakthrough in technology research and development and catch up with the industry's cutting-edge needs, it will soon be overtaken and replaced by other companies. Companies need to continuously invest in R&D and have a good vision of the future development and needs of the industry.

In December 2020, the relevant U.S. authorities listed SMIC and some of its subsidiaries and affiliates on the Entity List on the grounds of protecting U.S. national security and diplomatic interests. Suppliers are required to obtain export licenses from the U.S. authorities before they can supply SMIC with the five items subject to export control regulations, and for the five items dedicated to the production of 10nm and below technology nodes, the U.S. authorities will adopt a presumptive denial approval policy for review [12]. In addition, the U.S. also prohibits Dutch ASML from selling extreme ultraviolet lithography machines necessary for advanced processes to Chinese companies and foreign companies building advanced factories in China. If SMIC wants to engage in sub-10nm foundry, it will not be able to obtain the extreme ultraviolet lithography in the first place. This is also the reason why SMIC was forced to expand its mature process. Under the pressure of semiconductor technology and process, 28nm mature process has become the best choice for domestic wafer manufacturing. As the global chip shortage collides with the extremely high demand for IoT and automotive electronics, the shortage of mature process products such as MCU, display driver IC, PMIC and power discrete devices is very serious [4]. The 28nm process uses a manufacturing process and production equipment that is compatible with more mature processes such as 40nm and 60nm, and offers higher transistor speed and lower power consumption. From the perspective of near-term revenue and supply chain matching, completing the domestic 28nm mature process is a strategic step. However, in the long run, SMIC should continue to invest heavily in technology demonstration and R&D practice in order to compete with the leading foundry companies.

4.2. Technical Talent Drain

Technical talent is a critical factor in the IC industry. This type of talent needs to be familiar with the expertise and process. The slightest mistake can bring failure to wafer manufacturing. In its financial report, SMIC admits that the number of general employees and R&D staff has been on the
decline in recent years. In recent years, SMIC's employee turnover rate has been around 20%. In contrast, TSMC appears to be more competitive in attracting, recruiting and retaining talent. The number of its technical talents has been on the rise year by year in recent years [14]. According to statistics, at the end of June 2021, SMIC had 1,785 R&D employees, down 634 from 2,419 in the same period last year. Faced with the problem of continuous talent drain, SMIC needs to stabilize its incumbents internally and increase its attractiveness to talent externally. On July 21, 2021, SMIC announced that the company has officially granted option awards to its elite, mainly to directors, senior management, core technical staff, senior and middle-level business management, and technical and business key staff [4]. SMIC has stabilized its core team through equity incentives, realized the deep binding of employees' interests and shareholders’ interests, and further stimulated and released the enthusiasm and creativity of core talents.

4.3. Supply Chain Risk

China’s IC industry, including SMIC, relies heavily on overseas imports of raw materials, components and equipment. International economic, political and epidemic changes can affect the supply chain. For example, supply speed, raw material price fluctuations, and equipment import/export licenses. Most of these factors are outside of the company's control but can have a negative impact on production and growth. In this regard, SMIC should make some reserves of essential items to maintain normal operations during unstable times. In addition, SMIC can cultivate and bring in domestic suppliers and supply chains and maintain good partnerships with relevant Chinese companies. Among the strategic placement targets of SMIC is Qingdao Juyuan Xinxing Equity Investment Partnership, an investment institution consisting of 14 listed companies in the semiconductor industry chain and SMIC Juyuan [4]. Strategic cooperation with SMIC in terms of capital can facilitate product supply and deeper cooperation. More than that, the industry chain has the opportunity to promote localization and technological innovation to reduce dependence on imports. In addition, to reduce supply chain risks, SMIC has a set of supplier management scoring and assessment mechanism, which assesses many aspects such as product quality, quality management system, environmental protection, safety, logistics and storage, etc., and pays attention to the sustainable operation capability of suppliers.

4.4. Capital Risk

SMIC needs to continuously invest large amounts of capital to ensure sufficient production capacity, upgrade process technology platforms and support R&D practices. If the company’s revenue decreases or its financing direction is blocked and this large expenditure cannot be maintained, it may affect the company’s normal operations and hurt its competitiveness. Fortunately, SMIC has support from the national level. SMIC currently has three 8-inch fabs and three 12-inch fabs in Shanghai, Beijing, Tianjin and Shenzhen, and in 2021, SMIC and the National IC Industry Investment Fund II will establish joint ventures in Shanghai, Shenzhen and Beijing to accelerate the increase in wafer manufacturing capacity. In early 2022, the groundbreaking for the new fab in Shanghai Lingang will take place. SMIC Beijing and SMIC Shenzhen projects are steadily progressing and are expected to be in production by the end of 2022 [15].

5. SWOT Analysis

SWOT analysis carries out systematic analysis and evaluation from four perspectives of strengths, weaknesses, opportunities and threats by synthesizing the internal resources and capabilities of enterprises and various factors in the external environment, so as to select the optimal strategy. Table 1 can be derived from the above analysis:
SMIC has developed to a more mature scale now. What needs to be focused on now is how to enhance and leverage its own strengths, seize the opportunities of the external environment and counter the threats of external industry competition. SMIC currently has a significant market share in mainland China and positive development prospects. Therefore, WO strategy as well as WT strategy should be given more attention to pave the way for future development. Today’s volumes and revenues and the support from the political environment in mainland China do not require SMIC to think too much about the status quo. However, the IC foundry industry is technology-intensive and technology patents are the foundation and prerequisite for corporate development.
SMIC should take advantage of the current good opportunities to make more considerations for future development, and tilt more resources for R&D and innovation in order to gain core competitiveness in science and technology.

6. Conclusion

SMIC is currently in good shape in terms of order volume and production, but faces threats to its future growth. This is a technology-intensive industry and the company needs to catch up with the industry leaders as much as possible to stay ahead of the market and gain market share. The biggest challenge for SMIC’s future development is the risk of instability in further technology development and innovation in the face of competition and obstacles such as technology blockades from other countries. With limited capital, SMIC needs to make trade-offs and preferences between research and production investments to achieve a more favorable situation for future development. The weakness of this paper is the lack of analysis of companies with the same or similar strategies and similar strategic characteristics in the industries in which they are involved, in order to gain insight into their competitors. Also, the research and analysis of the industry technology in this paper is at a shallow level. In the future, the author will do more detailed comparisons between competitors in the same industry and do more understanding and analysis of the advanced technology in the production and operation.

References