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The Chinese Way Quality Revolution – How Is Technological Development

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Abstract: *From the standpoint of Chinese society, discussing the issue of economic and social development of a country, with quality as its topic, it will get less controversy in ideology. The quality of the subject to the "essence of substance" requirements are precise and accurate plus reliable; to the "process of business" focus on efficiency and effectiveness plus value; to the "conduct oneself" emphasis on words and deeds should be consistent; to the "quality of life" pursue the balance of production, ecology, life; to the society "Datong (The Ideal World)" is our dream. In terms of economic and social development, the Chinese community in Singapore, Hong Kong, Macao, Taiwan and Mainland China promotes "The Chinese Way TQM" in order to avoid internal friction and carry out the quality revolution of technological development. Technology can compete with other powerful countries and even surpass it to resist foreign aggression.*

The focus of Taiwan's industrial development is almost all of Information Communication Technology (ICT). However, in the era of Industry 4.0, although Taiwan can rely on the advantages of the past ICT industry to obtain admission tickets, the key to future success is not simply the development of science and technology, but also how to choose the right application area and operation mode, make good use of the future developing trend, and introduce artificial intelligence technology to enhance the overall industrial value. Nowadays, China's core technology is subject to others for a long time! The first step in solving this problem is to find out exactly which China is behind others and in which areas, seeing the direction can be stable and far-reaching. The core pain point of China's communications industry - the problem of "the lack of core and less soul" is once again severely placed in front of China."

This article aims to discuss how the semiconductor industry developed in the Chinese society, how to make good use of the advanced technology of the United States, Japan, and Europe to develop and gain a place in the world; and how to get into trouble due to the sanctions of the advanced technology of the United States, Japan, and Europe; even more talk about how to be self-independent and how to break through the embarrassment of development. Taking the technological revolution in Mainland China as the theme, focuses on technological development: the "Industrial Technology Innovation Capability Development Plan (2016-2020)" of the Ministry of Industry and Information Technology of Mainland China. This topic confirms the continuity of the reform and opening-up policy of the Mainland China authorities.

Keywords: *The Chinese way TQM, Quality Revolution, ICT Industry, IC Industry, ESG.*

I. Introduction

Since the 1990s, from system products such as personal computers, laptops, mobile phones, digital cameras, printers, scanners, etc., to motherboards, monitors, power supplies, hard drives, and other subsystem products, to the keyboard, connectors, network cards, and other components. This industry system is the most complete in Taiwan. The following picture was taken from Data Systems Consulting Co., Ltd in early 2000. It is the "Information Electronics Industry System Diagram," now we change it to the "Information and Communication Industry (ICT) System Map." We have been holding it to the present, because the future of Taiwan's industrial development is in this picture, and the past was, now is, and the future will be.

The focus of Taiwan's industrial development is almost all of Information Communication Technology (ICT). However, in the era of Industry 4.0, although Taiwan can rely on the advantages of the past ICT industry to obtain admission tickets, the key to future success is not simply the development of science and technology, but also how to choose the right application area and operation mode, make good use of the future developing trend, and introduce artificial intelligence technology to enhance the overall industrial value. At the beginning of the last century, W.A. Shewhart developed the quality control based on the control chart in Bell Lab., in order to solve the problem of telephone quality. He never imagined that the development and promotion of the past

century has been applied to such a huge industry, as shown in Figure 1: Information and Communication Industry (ICT) System Map and Figure 2: 1G → 2G → 3G → 4G → 5G.

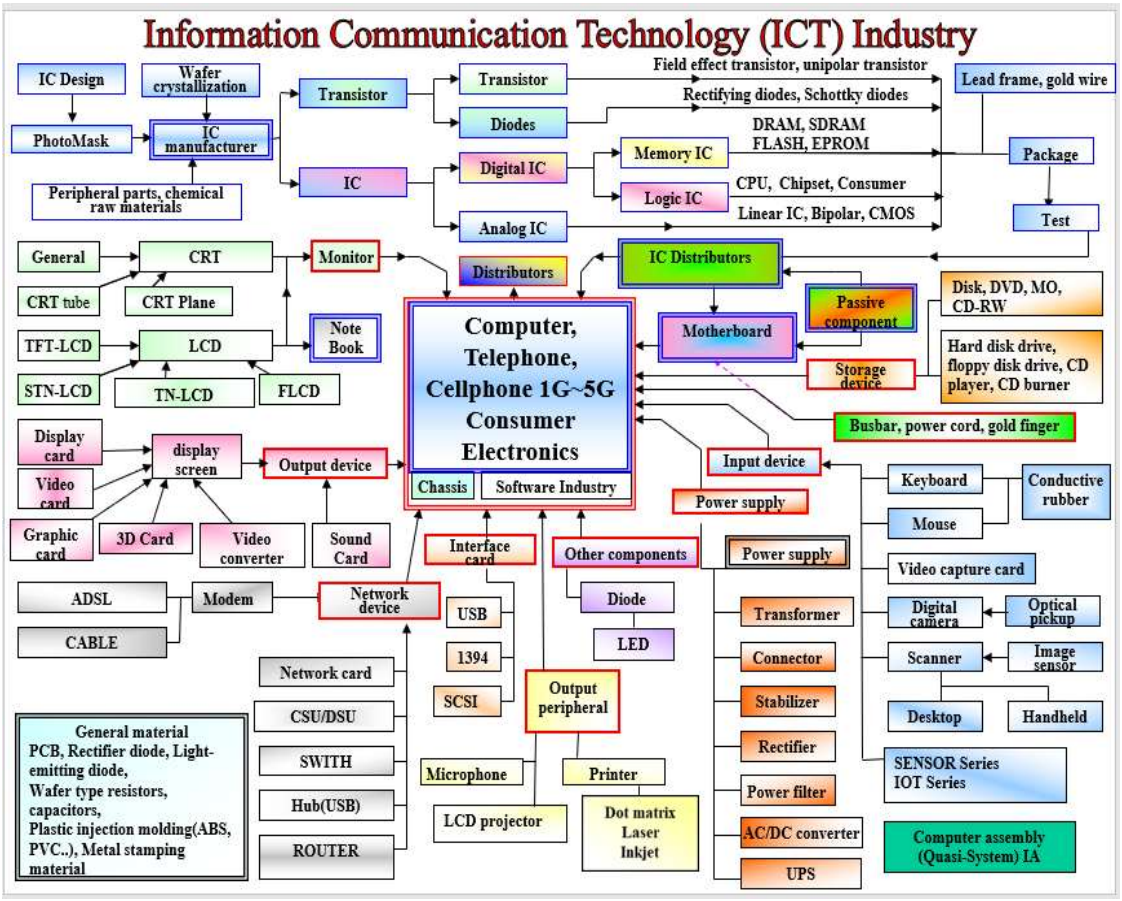

Figure 1: Information and Communication Industry (ICT) System Map

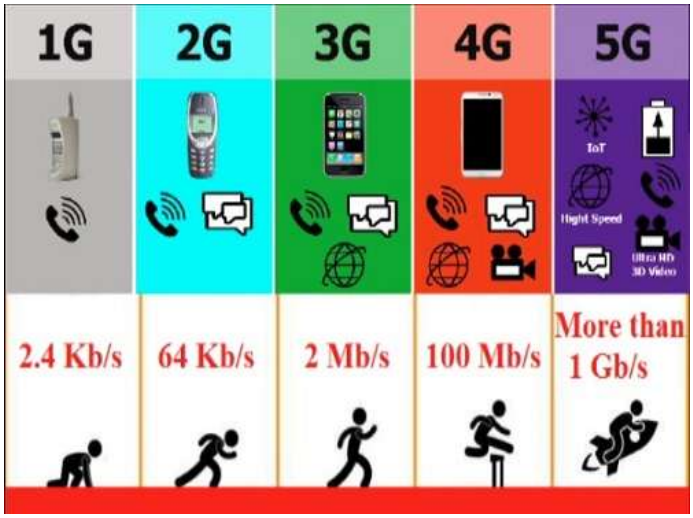

Figure 2: 1G→2G→3G→4G→5G

II. The Development of IC Industry

On April 25, 2018, the heading of Yanhuang Chunqiu Newspaper (炎黄春秋報) [1] "In addition to the core chip, China's 24 core technologies are not mastered." Reporting as follow: China's core technology is subject to others for a long time! The first step in solving this problem is to find out exactly which China is behind others and in which areas, seeing the direction can be stable and far-reaching. The core pain point of China's communications industry: the problem of "the lack of core and less soul" is once again severely placed in front of China.

Modern technology keeps on innovating to provide more convenient social activities, bringing unlimited possibilities to human life. In particular, the Internet and the cloud world rely on tens of thousands of computer servers to connect to each other, using computers, smartphones and related mobile devices, users can access various web pages and share diversified Apps. In addition to its applications, it can also support functions such as augmented reality/virtual reality (AR/VR), 3D imaging, and convenient payment, as well as sensor components, smart homes, wearable devices, automatic vehicles, smart manufacturing etc. All industries from e-commerce, financial services, medical care, agricultural production, to the industrial production are facing large-scale drastic changes. The foundation supporting all these developments is the semiconductor industry.

In the past few years, the factors driving the growth of the global semiconductor industry have mainly come from strengthening existing products, artificial intelligence products, 5G networks, automotive electronics, and industrial electronics. After the semiconductor industry created a sales record in 2018, the global market has shown a decline in 2019, and the outlook for 2020 is affected by the COVID-19, and it is not optimistic. After creating a record sale of US$468.8 billion in 2018, the global semiconductor industry's sales in 2019 dropped by 12% to only US$412.3 billion. This is mainly due to the cyclical impact of the memory market. Figure 3: Global semiconductor sales. [2]

The World Semiconductor Trade Statistics (WSTS) released in June 2020 predicts that the global semiconductor industry sales will slightly increase to US$426 billion in 2020, compared with the third quarter of 2019 WSTS forecasted for 2020 has been lowered, mainly due to the impact of the COVID-19 on the global economy and supply chain at the beginning of 2020. WSTS predicts that by 2021, global semiconductor industry sales will rebound to US$452 billion.

Figure 3: Global semiconductor sales (US$Billion) (picture source: 2020 STATE OF THE U.S. SEMICONDUCTOR INDUSTRY, Semiconductor Industry Association, 2020 July.)

Semiconductors are not only used in various products such as smart phones, computers, and automobiles and industrial equipment, but also create emerging markets such as AI, quantum computers, and advanced wireless networks including 5G. Advanced technology semiconductors can create better products, thereby bringing greater demand and sales revenue, which enables more industries to increase investment in research and development, develop more advanced semiconductor production capacity, and make new applications possible. However, in 2019, the sales of almost all types of semiconductor terminal products declined. As can be seen from Figure 4, sales of semiconductor products in all fields except the government and public sector have declined, and the computer field has the largest decline.

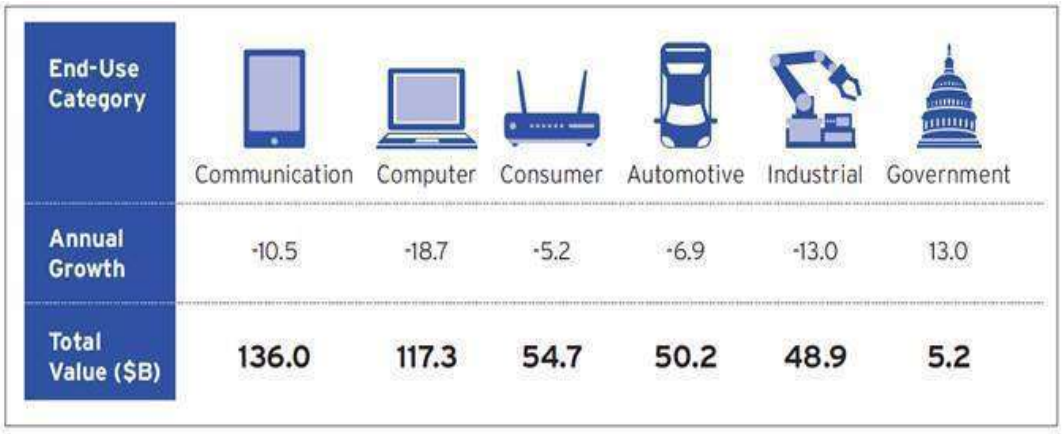

Figure 4: Sales of semiconductor products in all fields (picture source: 2020 STATE OF THE U.S. SEMICONDUCTOR INDUSTRY, Semiconductor Industry Association, 2020 July.)

The Sino-US trade war has brought many uncertainties to the technology industries of the two countries. If the two countries fail to reach an agreement in areas such as intellectual property rights, technology transfer, and cyber-attacks, in addition to tariff-related disputes, technical barriers to trade (TBT) will inevitably become stronger and stronger. However, the trade of war also just encourages Mainland China's companies to seek self-independent innovation, speed up the process of replacing domestic products, and ease the impact of future risks. Mainland China has launched a series of countermeasures to support the domestic semiconductor industry in recent years, including the establishment of a US$29 billion semiconductor investment fund, and plans to include the development of the third-generation semiconductor industry in the "14th Five-Year Plan" (2021-2025), from education, scientific research, development, financing, application and other aspects, vigorously support the development of the third-generation semiconductor industry, in order to realize the self-independence of the semiconductor industry.

III. The Technological Development of the IC Industry

Recently, tsmc founder Morris Chang told the media [3]: ***"Chip technology is very difficult. If the Mainland China wants to rely solely on its own strength, it will be difficult to succeed even if it develops chip manufacturing with a nationwide effort. At the same time, he also believes that it is almost impossible to narrow the gap with tsmc unless tsmc makes a mistake. So how difficult is wafer manufacturing? Is it really harder than a hydrogen bomb? This can be seen in this way. It is relatively simple to make a chip at common, but to make a high-tech chip, it is difficult to narrow the gap with others and catch up with others. It is much harder than just building a hydrogen bomb. Because the technology at that time was not as tightly sealed and confidential as it is now.***

At present, most of the core components of high technology come from the United States. The United States has key core technologies. It seems that China's companies cannot obtain them at all and can only make breakthroughs on their own. The core components of the lithography machine include etching machine, ion implanter, single crystal furnace, wafer scribing machine, wafer thinning machine, vapor phase epitaxial furnace, oxidation furnace, magnetron sputtering table, chemical mechanical grinding machine, wire bonder, probe test bench, etc.

More than 80,000 parts and components of the lithography machine come from hundreds of semiconductor companies. Under the restrictions of the United States, it will be much more difficult for China's companies to buy these parts. Without advanced prototypes, there is no export to the country at all. At the same time, because the machine has an anti-reverse design, reverse engineering is simply impossible. At present, if we want to make a breakthrough in chip technology, the software for designing chips, chip design technology, chip manufacturing technology, etc. are all difficult points one by one. Huawei has made breakthroughs in chip design, but the software for chip design is controlled by the United Kingdom, and manufacturing technology and equipment are controlled by countries such as the Netherlands, the United States, and Japan. It is very difficult to achieve a breakthrough."

The content of Morris Chang's conversation may be alarmist, but from the following easy to understand science and technology article "Chip Foundry Battle: Semiconductor Knowledge" [4], you can understand Morris Chang's words is proverbs sentence. One of the following excerpts is a proof:

"In fact, hundreds of millions of transistors are stuffed on a chip about half a centimeter long and wide and as the size of a fingernail. This chip contains electronic components such as transistors, which is called "Integrated Circuit (IC)". Transistor is nanometer grade, which is smaller than human cell. Samsung and tsmc are competing between 14nm and 16nm in advanced semiconductor manufacturing. 14nm refers to the width of the transistor current channel, the narrower the width, the lower the power consumption. However, the size of an atom is about 0.1 nanometers, and a 14-nanometer channel can only allow more than one hundred atoms to pass through. Therefore, as long as there is an atomic defect or a trace of impurity in the production process, it will affect the yield of the product. For semiconductor manufacturers, manufacturing process is technology, but yield is the key Know-how. Generally, it is very difficult to maintain the yield rate at around 80%. The yield rate of tsmc and UMC can reach more than 95%, which shows the technological level of Taiwan's foundry."

On May 15, 2020, tsmc announced that it plans to spend US$12 billion to build a 5-nanometer wafer factory in the United States, which will be located in Arizona. The main suppliers that cooperate with tsmc to invest in the United States are shown in Table 1. It can be seen from the table that tsmc's main supply chain mostly relies on advanced manufacturers in the United States, Japan, and Europe, and Taiwan's manufacturers can only supply lower-level equipment, raw materials and services. The semiconductor manufacturing process can be divided into four stages, including IC design, wafer manufacture, wafter fabrication, and back-end process. IC design includes circuit design, hardware descripition language coding, EDA/CAD and photomask production; wafer manufacture includes crystal pulling, cutting, grinding; wafter fabrication includes oxidation, lithography, etching, implantation, sputtering, and wafer probe testing; back-end process includes packaging and testing. Please refer to Figure 5: schematic diagram of semiconductor manufacturing process. In addition, the author participated in a project of tsmc Fab-3 in 1996, as shown in Figure 6: "tsmc Inline Measuring Calibration System." In the year, tsmc had been already a very important company in Taiwan, the project organized engineer warned me that the information is confidential, it was not allowed to be disclosed for three years. It scared me so much, then I dare to disclose in this article until more than 20 years later (2020).

Table 1: The main suppliers of tsmc

Key foreign process equipment manufacturers		
AAA	Deposition/polishing/plating/etching	U.S.
BBB	EUV high-end exposure machine	Netherlands
CCC	Heat treatment/deposition/etching/surface treatment	Japan
DDD	Etching/Chemical vapor deposition	U.S.
EEE	Electron beam wafer inspection equipment	Netherlands
FFF	Inspection, measurement and information analysis	U.S.
GGG	Wafer cleaning/etching coating/development	Japan
HHH	Through silicon via/wafer level packaging/vacuum device	Japan
III	Measuring equipment	Japan
JJJ	Semiconductor machine	Japan
KKK	Test Equipment	U.S.
Foreign component/material peripheral manufacturers		
LLL	Adhesive/heat dissipation material/planarization material	U.S.
MMM	Chemical cleaning products	U.S.
NNN	Semiconductor process materials	Japan
OOO	Specialty chemicals	U.S.
PPP	Polishing materials	Netherlands
QQQ	Developer and auxiliary	Japan
RRR	High purity sulfuric acid and ammonia	Germany
SSS	Material developer, auxiliary agent	Japan
TTT	Gas supply system design and installation	Japan
UUU	IPA /TMAH organic chemicals	Japan
Domestic semiconductor equipment production /agent.		
TVV	Ion implanter.	Taiwan
TWW	Wafer carrier	Taiwan
TXX	Wafer test probe card PCB	Taiwan
TYY	Cleaning detection ion planter	Taiwan
TZZ	Wafer carrier	Taiwan

Domestic system integration, factory engineering		
TAA	Dust-free room plant planning.	Taiwan
TBB	Equipment supplies agent and service.	Taiwan
TCC	Automation/storage/machines.	Taiwan
TDD	Semiconductor equipment and services.	Taiwan
TEE	IC design service	Taiwan
Domestic components/materials and peripherals		
TFF	Electronic chemicals	Taiwan
TGG	Electronic grade solvent	Taiwan
THH	Semiconductor material	Taiwan
TII	Nitrate ammonia sulfate.	Taiwan
TJJ	Chemical materials	Taiwan
TKK	Fluoric acid	Taiwan

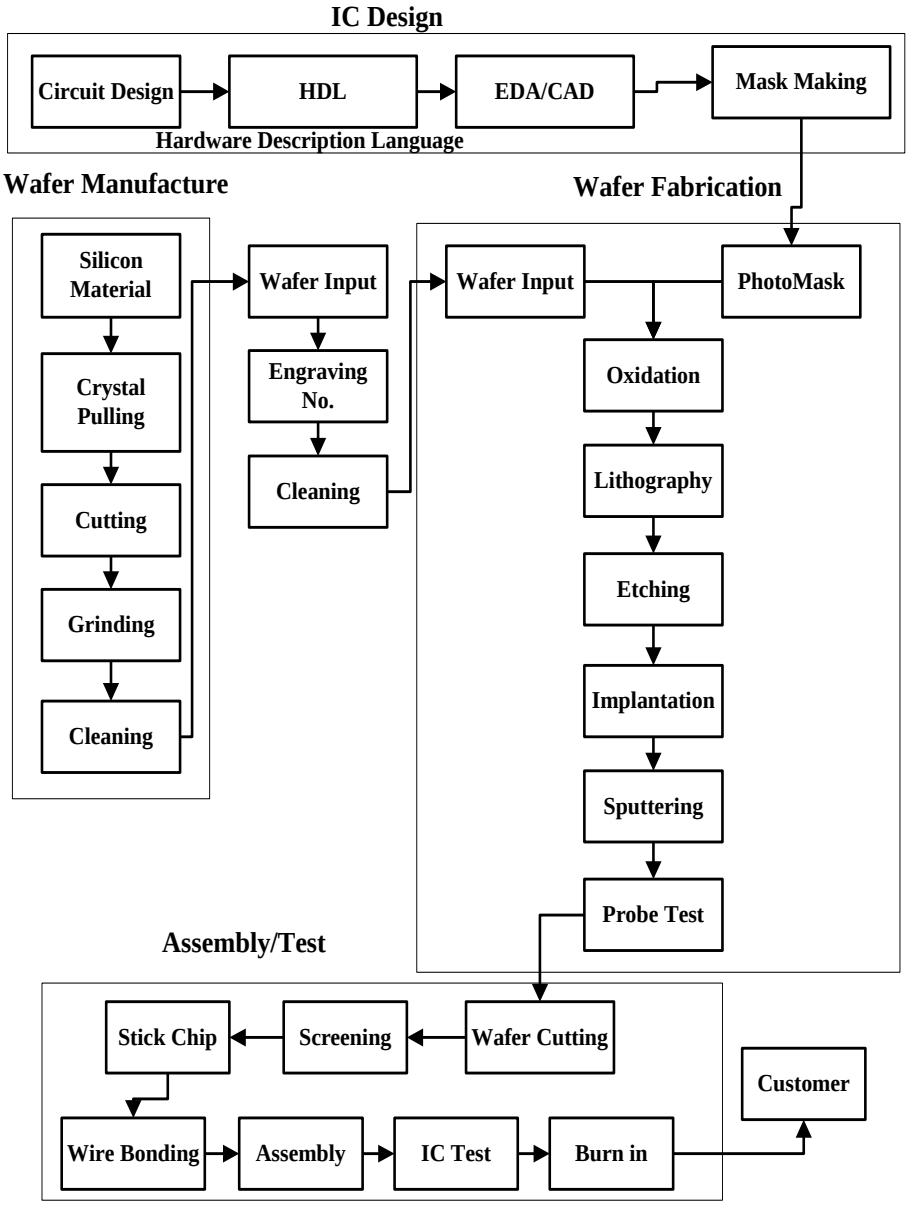

Figure 5: Schematic diagram of semiconductor manufacturing process

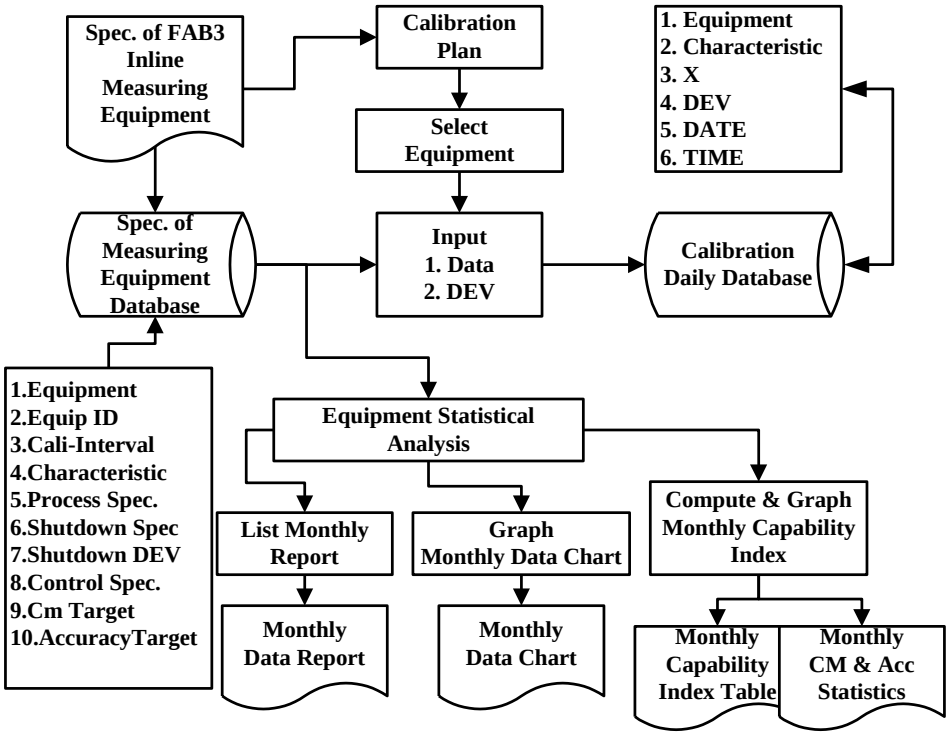

Figure 6: tsmc Inline Measuring Calibration System

On September 23, 2020, tsmc Chairman Mark Liu was invited to give a keynote speech at the Master Forum of SEMICON Taiwan 2020 (International Semiconductor Exhibition). He said: ***"In the past 40 years, semiconductor development has no national boundaries, information can be exchanged freely. Friends in Europe and the United States are no different, everyone is very close, but the atmosphere may change in the future."***

"Information exchange may no longer be so free, we may have to be prepared, competition will be fiercer, and production costs or development costs will be higher. Mark Liu explained that Taiwan must improve its technological level because the two sides of the Pacific Ocean (China And the U.S.) have established self-sufficient supply chains and want to produce independently. What about Taiwan? we can only upgrade our own technological capabilities, so that when they shrink the supply chain, they find that they don't have such technology, and they still have to look back to Taiwan equipment manufacturers or supply chain to provide solutions. Everyone shall make good use of the minds of Taiwanese engineers to improve their technological levels." [5]

The technology roadmap for key areas of "Made in China 2025" published by Mainland China in 2016, the author simplified the technology development roadmap for China's semiconductor industry, as shown in Table 2. The goal is as follows:

"Facing the two needs of national strategy and industrial development, we will focus on developing the integrated circuit design industry, accelerate the development of integrated circuit manufacturing, improve the development level of the advanced packaging and testing industry, and make breakthroughs in key integrated circuit equipment and materials. By 2020, the gap between the integrated circuit industry and the international advanced level will gradually narrow, the industry-wide sales revenue will grow at an average annual rate of over 20%, and the company's sustainable development capabilities will be greatly enhanced. Integrated circuit design technologies in key areas such as mobile smart terminals, network communications, cloud computing, Internet of Things, and big data can reach international leading standards, and an industrial ecosystem can be initially formed. The 16/14nm manufacturing process can achieve mass production, the packaging and testing technology can reach the international leading level, and the key equipment and materials can be entered into the international procurement system. Basically, a technologically advanced, safe and reliable integrated circuit industry system can be built. By 2030, the main links of the integrated circuit industry chain will reach the international advanced level, and a group of

companies will enter the first international echelon to achieve leapfrog development."

Table 2: "Made in China 2025" IC Industry Development Technology Roadmap.

Goal	**12-5(2011~2015)**	**13-5(2016~2020)**	**14-5(2021~2025)**	**15-5(2026~2030)**
IC manufacture	65-40 nm	28 nm	20-14 nm	Keep up with the international
	200,000/Month (12")	700,000/Month (12")	1,000,000/Month (12")	1,500,000/ Month (12")
IC design	28 nm design	28-20-14 nm design	20-14 nm design	Keep up with the international
IC package	Multi-chip package	3D system package		Multi-element integrated circuit
Focus	**12-5(2011~2015)**	**13-5(2016~2020)**	**14-5(2021~2025)**	**15-5(2026~2030)**
IC manufacture	HK metal gate and SiGe/SiC stress	FinFET		Quantum device
	Double exposure	Mutiple exposure	Extreme Ultraviolet Lithography (EUV）	Electron beam exposure
IC design	28 nm	28-20-14 nm	20-14 nm	Keep up with the international
IC package	Multi-chip package	3D system package		Multi-element integrated circuit
Equipment and materials	**12-5(2011~2015)**	**13-5(2016~2020)**	**14-5(2021~2025)**	**15-5(2026~2030)**
manufacture	90-32nm Equipment	20-14nm Equipment		18" Equipment
Lithography	90nm Lithography	Immersion Lithography		EUV Lithography
Material	65-32nm Material	22-14nm Material		12"/18" Silicon wafer
Package equipment & material	High-density packaging of high-end equipment and supporting materials	50% localization of some key equipment and materials in TSV manufacturing		Localization of packaging high-end equipment and supporting materials

Leaders must know "Diversity in Unity", and lead different people in the same direction; management must know "Unity in Diversity", and let everyone have their own directors under the same goal. The leader of an organization leads the organization to what level of the configuration, depending on the tacit knowledge accumulated by the leader's over the years and the explicit knowledge formed through the transformation of the data → information → knowledge, then wisdom is formed by the conversion of the two kinds of knowledge, and leads the stakeholders with wisdom. Therefore, an organization can establish a vision for the organization's sustainable development in the future; formulate reasonable goals; develop effective strategies; take feasible action plans; monitor and adjust goals, strategies, and plans.

The following are the issues of the technological revolution, which is based on tackling key problems: the **"Industrial Technology Innovation Capability Development Plan (2016-2020)"** of the Ministry of Industry and Information Technology of the Mainland China. [6] We translate and summarize it as follows.

Industrial Technology Innovation Capability Development Plan (2016-2020)

In order to implement the "Outline of the 13th Five-Year Plan," "Made in China 2025," "National Innovation-Driven Development Strategy Outline" and "13th Five-Year Plan of National Science and Technology Innovation;" clarify the objectives and major tasks for the development of technological innovation capability in the fields of industry and information of the 13th Five-Year Plan; guide and strengthen the technological innovation in key industries; enhance the capability of technological innovation in industries; and promote the industrial transformation and upgrading. China's Ministry of Industry and Information Technology issued in October 2016, "Industrial Technology Innovation Capability Development Plan (2016-2020)" proposed, by 2020, focusing on the establishment of about 15 manufacturing innovation centers around the country, accreditation of about 100 Ministry of Industry and Information Technology Key laboratories, building 60 industrial technology-based public service platform, around the core areas of smart manufacturing system revision of more than 10,000 standards, dominating the publication of more than 120 international standards.

This kind of Quality Function Deployment (QFD) or Policy Management of the mode of governance, deploy from the Central Committee of the 13th Five-Year Plan to the State Council's development strategy, and then by the Ministry of Industry and Information Technology in charge of his own professional projects to provinces, municipalities and autonomous regions related professional unit. This kind of top-down promotion and implementation model is very difficult to implement in a liberal democracy government body.

In addition to achieving the quantitative targets mentioned above, the main tasks of the "Development Plan for Industrial Technological Innovation Capability (2016-2020)" include several tasks and directions, some relevant topics in the field of quality related specialization are listed by columns as follows:

1. Column 1: Manufacturing Innovation Center Construction Project

Focus on the Ten key areas of "Made in China 2025", the next generation of information technology, high-end CNC machine tools and robots, aerospace equipment, marine engineering equipment and high-tech vessels, advanced rail transportation equipment, energy-saving and new energy vehicles, electric power equipment, agricultural machinery and equipment, new materials, biomedicine and high-performance medical equipment. Taking into account the needs of transformation and upgrading of the manufacturing industry; focusing on major national strategies; taking enterprises as the mainstay, combining industries, universities and research institutes. By means of corporate business model, constructing state-building Industry Innovation Center; focusing on industrial frontier and common key technology research and development; protection and application of intellectual property rights; the commercialization of scientific and technological achievements; standards development, public service, personnel training, international cooperation and other work to enhance China's manufacturing innovation ability.

According to the requirements of the Ministry of Industry and Information Technology on improving the manufacturing innovation system and advancing the guidance for the construction of manufacturing innovation centers and the layout requirements of the "Guide for Made in China 2025 provinces and cities in China" issued by the Ministry of Industry and Information Technology. Select the key industries to gather the advantages of provinces and cities, bringing together regional innovation resources, led by enterprises with industry influence, with capital as a link. Jointly with universities with strong R&D capabilities, with industry-leading research institutes or industrial parks that can integrate regional services, we will explore various synergistic modes of production, education and research and build provincial manufacturing innovation centers. Focus on major regional technology needs, explore the realization of diversified investment, diversification and market-oriented operation, the formation of new R&D institutions. By creating an innovation platform for regional manufacturing industry and serving as a support and complement to the national innovation center for manufacturing industry, the local manufacturing innovation capability will be promoted. By 2020, it will focus on the formation of about 15 national manufacturing innovation centers and a number of provincial manufacturing innovation centers.

2. Column 2: Utilization of Intellectual Property Rights Enhancement Project

Encourage and support enterprises to participate in market competition by using intellectual property rights, carry out actions to enhance the utilization of intellectual property rights of enterprises, foster a group of advantageous enterprises with the comprehensive strength of intellectual property rights, and exert the typical leading role of benchmark enterprises with intellectual property rights. Improve the enterprise-led, multi-participatory patent synergies system, to carry out industrial intellectual property rights to promote the use of synergy. We will promote the creation, layout, joint operation and profit sharing of intellectual property rights among members of the Alliance for Industrial Technology Innovation, encourage and support pillar enterprises in the industry and specialized agencies to collaborate in intellectual property evaluation, acquisition, operation and risk warning and response in key areas. Support the construction of intellectual property rights service operation platform for key industries and upgrade the intellectual property rights service capabilities of the industry.

3. Column 3: Standardization System Promotion Project

We will organize the implementation of the "Standardization and Quality Enhancement Plan for Equipment Manufacturing Industry" and promote the standardization in key areas such as promote the integration of information technology and industrialization, smart manufacturing, green manufacturing, industrial foundation, 5G, mobile Internet, smart hardware, smart home, cloud computing and big data. Support the establishment of key areas of standard promotion union. Support the development of corporate standards that meet market and innovation needs and establish a system of self-disclosure and supervision of corporate product and service

standards. Promote the basic common standards, testing methods and standards with international standards, encourage and support enterprises, research institutes, industry organizations to participate in international standards, enhance international standard drafting in the right of speech and dominance, and promote the internationalization of our standard process.

4. Column 12: Software and information technology services focus on the direction of development

Fundamentals and Application Software Technology: Industrial Foundation Software Platform, Industrial Operating System, Industrial Data Integration and Processing Platform System, Manufacturing Operations Management System, Model-Based Systems Engineering, Computer Aided Design and Manufacturing Modeling, Semantic Web Modeling, Knowledge Modeling , 3D Modeling of Complex Personalized Products, Full Life Cycle Flexible Modeling, Human-Intelligence Integration Modeling, Multi-Domain Unified Modeling and Joint Simulation, Engineering Analysis, Multi-Disciplinary Optimization and Comprehensive Simulation.

Cloud Computing and Big Data Technology: Hardware (Server, Sensor, Manufacturing Equipment), Resource Virtualization and Service Technology, Data Resource Transfer, Data Acquisition, Data Storage, Data Pick, Data Integrate, Data Management, Data Display Technology, Intelligent Information Processing Technology Based on Cognitive Mechanism, Intelligent Voice Technology, and Semantic-Based Retrieval Technology.

Information Security Technologies: Information Security Technologies such as Vulnerability Scanning for Industrial Systems and Devices, Exploitations of Vulnerabilities and Host Protection, Key Technologies and Products in Information Security for Industrial Big Data, Industrial Cloud and Cyber Physical Systems (CPS), Industrial Firewalls, Networks Gateways and other industrial information security border protection products, Advanced Persistent Threat (APT) Protection, attack detection and traceability, electronic authentication technology, trusted websites, trusted mobile applications (APP), trusted mail and other electronic certification.

IV. Conclusion

The differences of political systems in the Chinese community, Singapore, Hong Kong, Macao, Taiwan and Mainland China, they all have their own historical backgrounds. Rather discussing their strengths, weaknesses, opportunities and threats of technological development than arguing about liberal democracy and authoritarian central which is superior. Systematically focus resources and actions on their strengths, invest in the opportunities; and allow companies to strengthen or avoid weaknesses, control or reduce the risk of external threats.

The ISO 9000 series has undergone several revisions and promotions, and has now moved from the perspective of sustainable operation and management to the integration of overall development gradually. This sustainable development system architecture is based on the three major aspects of economy, ecology and society to form a Sustainable Development Architecture. It not only hopes to be compatible with the system, but also strikes a balance between professional and industry requirements. In the future, the integration of management systems of enterprises need to be taken into account, which can be called the **"ESG - Integrated Management Systems."** Its architecture is shown in Figure 7.

Figure 7: ESG - integrated management systems

The 13th Five-Year Plan in Mainland China takes "building a well-off society in all respects" as its central goal, and proposes five development concepts of "innovation", "coordination", "green", "openness" and "sharing" which are exactly in line with the above. In terms of "innovation," the enhancement of internal national power cannot only rely on land, resources, and labor in exchange for it, but also rely on technological innovation and reform to develop new competitive advantages and new business models. This quality revolution is a deep integration of information technology and manufacturing that based on the digitization, networking, and intelligence of the manufacturing industry. At the same time, it adds new energy and new materials to reduce energe consumption and environment pollution.

However, the quality revolution is comprehensive, not just a process of technological development, but also a way to "build a well-off society in an all-round way," and it is the foundation of the country's social modernization. Discussing the issue of economic and social development of a country, with quality as its topic, it will get less controversy in ideology. The quality of the subject to the “essence of substance” requirements are precise and accurate plus reliable; to the “process of business” focus on efficiency and effectiveness plus value; to the “conduct oneself” emphasis on words and deeds should be consistent; to the “quality of life” pursue the balance of production, ecology, life; to the society “Datong (The Ideal World)” is our dream. Under the guidance of the above-mentioned quality issues, in addition to the quality revolution of technological development, the quality professional field should pay attention to the modernization of the country and society, and take some national and international social responsibilities.

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