5.

Operational Highlights

5.1 Business Activities

5.1.1 Business Scope

As the founder and leader of the dedicated semiconductor foundry segment, TSMC provides a full range of integrated semiconductor foundry services, including the most advanced process technologies, leading specialty technologies, the most comprehensive design ecosystem support, excellent manufacturing productivity and quality, advanced mask and packaging services, and so on, to fulfill an increasing variety of customer needs. The Company strives to provide the best overall value to its customers and TSMC believes its customers success is TSMC s success. As a result, TSMC has won customer trust from around the world and has experienced strong growth and success.

5.1.2 Customer Applications

TSMC manufactured 9,275 different products for 449 customers in 2016. These chips were used across the entire spectrum of electronic applications, including computers and peripherals, information appliances, wired and wireless communications systems, automotive and industrial equipment, consumer electronics such as DVDs, digital TVs, game consoles, digital still cameras and many other applications.

The rapid evolution of end products drives customers to use TSMC s innovative technologies and services, while at the same time spurring TSMC s own development of technology. As always, success depends on leading rather than following industry trends.

5.1.3 Consolidated Shipments and Net Revenue in 2016 and 2015

Unit: Shipments (thousand 12-inch equivalent wafers) / Net Revenue (NT$ thousands)

		2016		2015	
		Shipments	Net Revenue	Shipments	Net Revenue
Wafer	Domestic (Note 1)	1,849	129,150,510	1,588	100,189,156
	Export	7,757	780,028,641	7,175	702,748,813
Others (Note 2)	Domestic (Note 1)	N/A	5,369,724	N/A	5,535,154
	Export	N/A	33,389,469	N/A	35,024,245
Total	Domestic (Note 1)	1,849	134,520,234	1,588	105,724,310
	Export	7,757	813,418,110	7,175	737,773,058

Note 1: Domestic means sales to Taiwan.
Note 2: Others majorly include revenue associated with mask making, design services, and royalties.

5.1.4 Production in 2016 and 2015

Unit: Capacity / Output (million 12-inch equivalent wafers) / Amount (NT$ millions)

Wafers			
Year	Capacity	Output	Amount
2016	10-11	9-10	405,462
2015	9-10	8-9	378,871

5.2 Technology Leadership

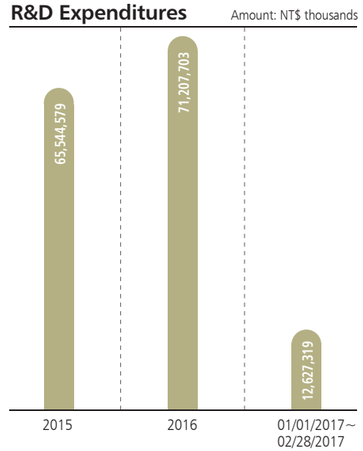
5.2.1 R&D Organization and Investment

In 2016 TSMC continued to invest in research and development, with total R&D expenditures amounting to 8% of revenue, a level that equals or exceeds the R&D investment of many other leading high-tech companies.

TSMC recognizes that the technology challenge of continuing to extend Moore s Law, the doubling of semiconductor computing power every two years, is becoming increasingly complex and difficult. The efforts of the R&D organization are focused on enabling the Company to continuously offer its customers first-to-market, leading-edge technologies and design solutions that contribute to their product success in today s competitive market environment. In 2016 the R&D organization met these challenges by completing the transfer to manufacturing of the industry leading 10nm technology, the 3rd generation of technology platform to make use of 3D FinFET transistors. The R&D organization continues to fuel the pipeline of technological innovation needed to maintain industry leadership. TSMC s 7nm technology development is on track to meet the goal of production start-up in 2017. TSMC 5nm technology is now in the full development stage, and the definition and intensive early development efforts have been started for nodes beyond 5nm.

In addition to CMOS logic, TSMC conducts R&D on a wide range of other semiconductor technologies that provide the functionality customers require for mobile SoC and other applications. Highlights in 2016 include: the world s first high-volume production of Integrated Fan-Out Package on Package (InFO PoP) for mobile application processor packaging; successful qualification of InFO PoP Gen-2 advanced packaging technology for mobile applications and InFO wafer-level fine-pitch fan-out technology for die-partition and high-speed applications; 0.18μm second generation BCD (binary-coded decimal) technology resulting in the world s highest performance quick charger and wireless charger in 2016; successful production launch of e-Flash 65nm/55nm node, NOR-based cell technologies, including 1-T cell and split-gate cell; completion of qualification of the 40nm node, split-gate cell technology for consumer electronics applications such as IoT and smartcards; and development and manufacturing qualification of 650V D-MISFET, 100V E-HEMT, and RF 30V D-MISFET GaN devices.

TSMC maintains a network of important external R&D partnerships and alliances with world-class research institutions, including IMEC, the highly regarded European R&D consortium, where TSMC is a core partner. TSMC also provides funding for nanotechnology research at leading universities worldwide to promote innovation and the advancement of nano-electronic technology. TSMC has established four joint research centers within Taiwan: National Taiwan University, National Chao Tung University, National Tsing Hua University, and National Cheng Kung University. The goal of these centers is to develop greater understanding of the devices and materials used in the manufacture of advanced silicon technologies.



5.2.2 R&D Accomplishments in 2016

Highlights

- 10nm Technology

10nm technology offers substantial density improvement with better performance at same power or power reduction at the same chip performance compared to earlier technology generations and began customer product tape-out in the first quarter and production ramp-up in the fourth quarter of 2016.

- 7nm Technology

TSMC focused on the manufacturing baseline process setup, yield learning, transistor and interconnect R/C performance improvement and the reliability evaluation of 7nm technology, which offers significant density improvement with better performance at same power or lower power consumption at comparable performance vs. 10nm technology. During the

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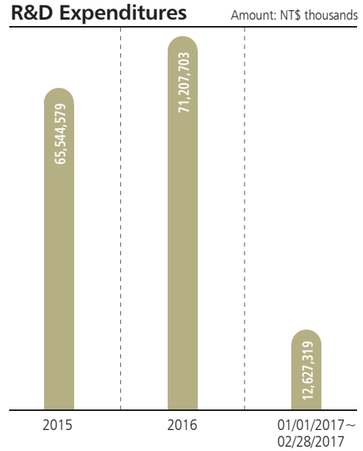

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year, major customers and IP vendors completed IP design and started silicon validation. TSMC plans to complete 7nm qualification for risk production in 2017.

• 5nm Technology

Development activities in 2016 focused on test vehicle design and implementation, mask making, and pilot run. Even though the semiconductor industry is approaching the physical limits of silicon, 5nm technology still follows Moore's Law and delivers substantial density improvement with better performance at same power or lower power consumption at comparable performance. TSMC will focus on manufacturing baseline process setup, yield learning, transistor and interconnect R/C performance improvement and reliability evaluation and plans to continue 5nm full development in 2017 and 2018 for risk production in 2019.

• Lithography Technology

The main focus for RD lithography in 2016 is 7nm and 5nm development. For 7nm development, the primarily focus is on continuous improvement of overlay control, defect reduction, and patterning robustness in preparation for 7nm qualification. As for 5nm development, EUV lithography will be used to reduce the complex multiple-patterning process steps. In 2017, TSMC will take the delivery of newest generation of EUV scanners to meet the tightened overlay control and imaging requirement for 5nm and beyond.

In 2016, the EUV program made continuous improvement in light-source power and its stability, which has enabled faster learning rate and process development for advanced nodes. Additional progress was made with resist process, pellicle, and related mask blanks, as EUV technology moves closer to full scale R&D and manufacturing readiness.

• Mask Technology

Mask technology is an integral part of our advanced lithography. In 2016, R&D successfully completed the development of mask technology for the 7nm node. This technology is being transferred to the mask production organization. During the same period, solid progress was made on the development of mask technology for EUV lithography, including the reduction of native defects on mask blanks and the fabrication of EUV masks for lithographic processing of 7nm and 5nm nodes.

Integrated Interconnect and Packaging

CoWoS®, InFO and Under-Bump-Metallurgy Free Integration (UBM-free integration, UFI) are part of the generic wafer level system integration (WLSI) technology platform, which leverages TSMC's core competency in wafer processes for heterogeneous system integration and packaging to meet the specific customer needs in performance, power, profile, cycle time and cost. InFO, UFI and CoWoS® are continuously evolving to fulfill diversified markets such as IoTs, automotive, high-performance computing and telecommunication.

• 3D IC

2016 was a landmark year for system integration, as TSMC launched the world's first high-volume manufacturing (HVM) InFO PoP packaging for mobile applications processors. During the year, TSMC also successfully qualified InFO PoP Gen-2 advanced packaging technology for mobile applications and wafer-level fine-pitch InFO technology for die-partition and high-speed applications. Production ramp-up of fine-pitch fan-out HVM is expected in 2017. In interposer CoWoS® technology, the application was rapidly extended to 16nm starting from the FPGA (field programmable gate array) family. In addition, TSMC leads the industry by starting mass production of super high-end accelerators that integrate multiple HBM2 (second generation high bandwidth memory) chips and GPUs, resulting in a brand new application for CoWoS® in the HPC area of artificial intelligence and deep learning.

• Advanced Package

TSMC offers a wide variety of lead-free packaging solutions for mobile/handheld devices. 10nm FinFET Si with ultra-fine pitch copper packaging was developed and qualification was successfully completed in the fourth quarter of 2016. The low-cost and large die area up to 108mm^2 with highly reliable 80μm pitch copper packaging technology will be inserted into customers' mass production from 2017 onward. In 2016, the low-cost, innovative and highly reliable fan-in WLCSP technology was completed and transferred to Fab for mass production of die size 5x5mm^2. Expanding its application envelope, in addition to larger die size 7x7mm^2, this technology also passed the reliability qualification for even larger die sizes up to 10x10mm^2.

• Advanced Interconnect

Several leading interconnect technologies were optimized and implemented in the 5nm node during 2016. Both chip performance and power utilization were effectively enhanced. These state-of-the-art technologies included an innovative integrated low-cost patterning process with the extension of immersion lithography and cutting-edge EUV patterning technology, optimized metal layer stacking combinations, and a novel thin copper barrier process with prominent reliabilities. In addition TSMC deployed experienced experts and relevant resources to develop technology nodes of 3nm and beyond.

Advanced Transistor Research

Innovation in transistor architectures and materials has enabled increased speed and reduction of power consumption in advanced logic technologies. TSMC is at the forefront of transistor research on devices with high mobility channel materials for beyond Silicon CMOS. Complementing this research are further efforts focusing on innovative solutions to address challenges to technology performance from parasitic resistances and capacitances. TSMC research is expected to pave the way for continued density scaling while maximizing performance and minimizing power on advanced logic technologies for mobile and high-performance applications.

Specialty Technologies

TSMC offers a broad mix of technologies to address a wide range of applications:

• Mixed Signal/Radio Frequency (MS/RF) Technology

In 2016, TSMC developed a 7nm silicon, electromagnetic simulation-based design to facilitate high-speed circuit design with layout specifications. To meet growing demand for low-power consumption and leakage current in mobile devices, TSMC also introduced 16FF RF technology, e.g. for 4G LTE applications. In order to improve performance regarding insertion loss and isolation, TSMC further reduced the key parameter Ron-Coff to ~102 fs (femtoseconds) to enable cellular/Wi-Fi RF switch applications.

• Power IC/Bipolar-CMOS-DMOS (BCD) Technology

TSMC's 0.18μm second-generation BCD technology enabled the world's highest-performance quick charger and wireless charger in 2016. 0.18μm third-generation BCD technology is ramping up and will provide an even better solution with higher performance at lower cost. Targeting 5V and below mobile power management, newly developed asymmetric power switch in 0.13μm BCD technology will enable higher efficiency power supply for mobile devices.

• Panel Drivers

TSMC completed process qualification of 40nm high-voltage 6V/25-32V low-power panel driver technology with several customer product verifications ongoing. This technology supports Super Retina display driver ICs and touch-display driver ICs for high-end mobile phones. In addition, TSMC introduced Phase-2 with a 22% SRAM bitcell reduction as well as 8V/25-32V process technology for OLED drivers; several customers have designs in and plan to tape out in the first quarter of 2017.

• Micro-electromechanical Systems (MEMS) Technology

In 2016, TSMC's modular MEMS technology was qualified for mass production of accelerometers and a pilot run of high-resolution pressure sensors. Future plans include the development of next-generation high-sensitivity thin microphone, MEMS Si-pillar TSV (through silicon via) technology and BioMEMS applications.

• GaN Technology

In 2016, 650V D-MISFET, 100V E-HEMT, and RF 30V D-MISFET GaN devices were developed and qualified for manufacturing.

• Complementary Metal-Oxide-Semiconductor (CMOS) Image Sensor Technology

In 2016, CMOS image sensor technology made the following breakthroughs: (1) high-density wafer hybrid bond technology; (2) second-generation wafer backside trench isolation for pixels; and (3) composite metal grid structure for SNR (signal-to-noise ratio) per pixel improvement. The first breakthrough achieved the world's most advanced pitch density. The second and third breakthroughs reduced per-pixel electrical and optical cross-talk for better image quality compared to previous generations of optical structures. All three technologies passed product and process qualification and are progressing toward mass production.

• Flash/Embedded Flash Technology

TSMC achieved several important milestones in embedded flash technologies in 2016. At the more mature 65nm/55nm node, NOR-based cell technologies, including 1-T cell and Split-Gate cell, were successfully put in production. At the 40nm node, split-gate cell technology completed qualification for consumer electronics applications such as IoT and smartcards, and also completed customer product qualification were put in production. This technology will be adopted for automobile electronics, the development is undergoing. Embedded flash development on the 28nm low-power and 28nm high-performance mobile computing platforms is underway for low-leakage applications in areas such as automobile electronics and micro controller units (MCU).

5.2.3 Technology Platform

TSMC provides customers with advanced technology platforms that include the comprehensive design infrastructure required to optimize design productivity and cycle time. These include: design flows for electronic design automation (EDA); silicon-proven IP building blocks, such as libraries; and simulation and verification design kits, i.e., process design kits (PDK) and technology files.

The availability of 7nm FinFET saw improvements in design infrastructure using an advanced CPU core as the vehicle to support customers' adoption of 7nm FinFET. (EDA tool certification results can be found on TSMC-Online.) TSMC also extended its IP quality program (TSMC 9000) to allow IP audits to be performed either at TSMC or at TSMC-certified laboratories. To help customers plan new product tape-outs incorporating IP/Library from TSMC's Open Innovation Platform® (OIP) ecosystem, the OIP ecosystem added a portal to connect customers to an ecosystem of 43 solution providers.

5.2.4 Design Enablement

TSMC's technology platforms provide a solid foundation to facilitate the design process. Customers can design directly using the Company's internally developed IP and tools or using those that are available from TSMC's OIP partners.

Tech Files and PDKs

TSMC provides a broad range of process design kits (PDKs) for digital logic, mixed-signal, radio frequency (RF), high-voltage driver, CMOS image sensor (CIS) and embedded flash technologies across a range of technology nodes from 0.5μm to 7nm. In addition, the Company provides technology files for DRC (design rule checking), LVS (layout verification of schematic), RC (resistance-capacitance) extraction, automatic place and route, and a layout editor to ensure process technology information is accurately represented in EDA (electronic design automation) tools. By 2016, TSMC had provided more than 8,200 technology files and more than 270 PDKs via TSMC-Online. There are more than 100,000 customer downloads of these files every year.

Library and IP

TSMC and its alliance partners offer customers a rich portfolio of reusable IPs, which are essential building blocks for many circuit designs. In 2016, over 60% of new tape-outs at TSMC adopted one or more libraries or IP from TSMC and/or OIP partners, as the Company expanded its library and silicon IP portfolio to contain more than 12,000 items, a 20% increase over 2015.

Design Methodology and Flow

In 2016 TSMC addressed critical design challenges associated with the new 7nm FinFET technology for digital and SoC applications by announcing the readiness of reference flows through OIP collaboration that feature FinFET-specific design solutions and methodologies for performance, power and area optimization.

5.2.5 Intellectual Property

A strong portfolio of intellectual property rights strengthens TSMC's technology leadership and protects our advanced and leading edge technologies. In 2016, TSMC received a total of 2,294 U.S. patents, which is a 30% increase from the previous year, and thus reached a historical-high ranking of #9 in terms of U.S. patent grants. Additionally, TSMC received over 1,200 issued patents in Taiwan and PRC, which is a 59% increase from the previous year, as well as patents in other various countries. TSMC's patent portfolio now reaches over 35,000 patents worldwide (including patent applications in queue). We continue to implement a unified strategic plan for TSMC's intellectual capital management. Strategic considerations and close alignment with the business objectives drive the timely creation, management and use of our intellectual property.

At TSMC, we have built a process to extract value from our intellectual property by aligning our intellectual property strategy with our R&D, operations, business objectives, marketing, and corporate development strategies. Intellectual property rights protect our freedom to operate, enhance our competitive position, and give us leverage to participate in many profit-generating activities.

We have worked continuously to improve the quality of our intellectual property portfolio and to reduce the costs of maintaining it. We plan to continue investing in our intellectual property portfolio and intellectual property management system to ensure that we protect our technology leadership and receive maximum business value from our intellectual property rights.

5.2.6 TSMC University Collaboration Programs

In recent years, TSMC has significantly expanded its interaction with universities in Taiwan with the collaboration of research projects at some of the nation's most prestigious institutions. The mission of these projects is twofold: to increase the number of highly qualified students suitable for employment in semiconductor industry, and to inspire university professors to initiate research programs that focus on the frontiers of semiconductor science, including device, process and materials technology, semiconductor manufacturing and engineering science, and specialty technologies for electronic applications. Since 2013, TSMC has established four research centers at National Taiwan University, National Chiao Tung University, National Cheng Kung University and National Tsing Hua University. In 2015, TSMC started cooperation with International College of the Semiconductor Technology and continued to enhance cooperation with other schools. Currently, several hundred high-caliber students have joined the research centers with backgrounds in the disciplines of electronics, physics, materials engineering, chemistry, chemical engineering and mechanical engineering.

In addition, TSMC also conducts strategic research projects at top overseas universities, such as Stanford, MIT, UC Berkeley and so on. The focus is on disruptive capabilities in transistors, interconnect, patterning, modeling and special technologies.

TSMC University Shuttle Program

The TSMC University Shuttle Program was established to provide professors at leading research universities worldwide with access to the advanced silicon process technologies needed to research and develop innovative circuit design concepts. This program links motivated professors and graduate students to enthusiastic managers at TSMC with the goals of promoting excellence in the development of advanced silicon design technologies and nurturing new generations of engineering talent in the semiconductor field.

The program provides access to TSMC silicon process technologies for digital, analog/mixed-signal circuits, RF designs and micro-electromechanical system designs. Participants in the TSMC University Shuttle Program include major university research groups worldwide. TSMC and the University Shuttle Program participants achieve "win-win" collaboration through the program, which allows graduate students to implement exciting designs and achieve silicon proof points for innovations in various end-applications.

5.2.7 Future R&D Plans

To maintain and strengthen TSMC's technology leadership, the Company plans to continue investing heavily in R&D. In addition to 7nm and 5nm CMOS nodes already in the pipeline, the Company's reinforced exploratory R&D work is on track to establish a solid foundation to feed into technology platforms beyond the 5nm node. The Company's exploratory work focuses on new transistors and technologies, such as 3D structures, strain-engineered CMOS, high-mobility materials and novel 3D IC devices. These studies emphasize innovation and are guided by deep understanding of the fundamental physics of nanometer CMOS transistors and related technologies. The Company also continues to collaborate with external research bodies from academia and industry consortia alike with the goal of extending Moore's Law and paving the road to future cost-effective technologies and manufacturing solutions for its customers.

With a highly competent and dedicated R&D team and its unwavering commitment to innovation, TSMC is confident in its ability to deliver the best and most cost-effective SoC technologies to its customers and to drive future business growth and profitability for years to come.

Summary of TSMC's Major Future R&D Projects

Project Name	Description	Risk Production (Estimated Target Schedule)
7nm logic platform technology and applications	4th generation FinFET CMOS platform technology for SoC	2017
5nm logic platform technology and applications	5th generation FinFET CMOS platform technology for SoC	2019
3D IC	Cost-effective solution with better form factor and performance for System-in-Package (SiP)	2016 ~ 2017
Next-generation lithography	EUV lithography and related patterning technology to extend Moore's Law	2016 ~ 2019
Long-term research	Specialty SoC technology (including new NVM, MEMS, RF, analog) and transistors for 5nm node and beyond	2015 ~ 2019

The projects above account for roughly 70% of the total R&D budget for 2017, estimated to be around 8% of 2017 revenue.

5.3 Manufacturing Excellence

5.3.1 GIGAFAB® Facilities

Maintaining dependable capacity is a key part of TSMC's manufacturing strategy. The Company currently operates three 12-inch GIGAFAB® facilities – Fab 12, Fab 14, and Fab 15. The combined capacity of the three facilities exceeded six million 12-inch wafers in 2016. Production within these three facilities supports 0.13μm, 90nm, 65nm, 40nm, 28nm, 20nm, 16nm, and 10nm process technologies, including each technology's sub-nodes. An additional portion of the capacity is reserved for R&D work on leading-edge manufacturing technologies, which currently supports the technology development of the 7nm node and beyond.

TSMC has developed a centralized fab manufacturing management system, super manufacturing platform (SMP), to provide customers with greater benefits in the form of more consistent quality and reliability, improved flexibility to cope with demand fluctuations, faster yield learning and time-to-volume, and lower-cost product requalification.

5.3.2 Engineering Performance Optimization

As advanced technology continues to evolve, the geometry keeps shrinking and the need for tighter process control have become extremely challenging for manufacturing. TSMC's unique manufacturing infrastructure is tailored with tightened process control and diversified product portfolio to fulfill higher product performance requirements. To achieve overall optimization of equipment, process and yield, the process control and analysis systems have been integrated with many intelligent functions to perform self-diagnosis and self-reacting, which have remarkable results in yield enhancement, workflow improvement, fault detection, cost reduction and R&D cycle decrement.

TSMC has developed Precise Fault Detection and Classification system, Intelligent Advanced Equipment Control and Intelligent Advanced Process Control to monitor the manufacturing process in a timely manner and adjust conditions precisely. To satisfy advanced and accurate process control and ensure highly efficient and effective production, the Company has created Precision Equipment Matching and Yield Mining to minimize process variation and potential yield loss. The Company has further developed Big Data, Machine Learning, and Artificial Intelligence architecture to identify critical variables to optimize yield management and operating efficiency to fulfill customers' special process requirements and to cope with diversified product demand simultaneously.

5.3.3 Agile and Intelligent Operations

TSMC continues to drive manufacturing excellence through agile and intelligent operations. The Company's sophisticated agile operation system has integrated demand and capacity modeling, lean WIP (Work in Process) line management, and lot dispatching and scheduling, and on time delivery system to provide short cycle time, stable manufacturing and on-time delivery. The system also provides great flexibility to quickly support customers' urgent pull-in requests when needed.

TSMC has also introduced new applications such as IoT devices, intelligent mobile devices, and mobile robots that help to consolidate data collection, yield traceability, workflow efficiency, and material transportation to continuously enhance fab operating efficiency.

Following its commitment to manufacturing excellence, TSMC has integrated the technology of advanced data analysis, smart diagnostics, self-reactive, precise forecasting and operational knowledge to revolutionize the fab operating mode from "Auto" to "Intelligent," to optimize efficiency, flexibility and quality while maximizing cost effectiveness and accelerating overall innovation.

5.3.4 Raw Materials and Supply Chain Management

In 2016, TSMC continued to hold review meetings periodically with teams from operations, quality control and business to proactively identify and manage the risks of insufficient supply capacity, quality issues and supply chain interruption. TSMC also worked with suppliers to enhance performance, quality, delivery and sustainability, as well as to support green procurement, environmental protection and safety.

Raw Materials Supply

Major Materials	Major Suppliers	Market Status	Procurement Strategy
Raw Wafers	F.S.T. GlobalWafers S.E.H. Siltronic SUMCO	These five suppliers together provide over 90% of the world's raw wafer supply. Each supplier has multiple manufacturing sites in order to meet customer demand, including plants in North America, Asia, and Europe.	•TSMC's suppliers of silicon wafers are required to pass stringent quality certification procedures. •TSMC procures wafers from multiple sources to ensure adequate supplies for volume manufacturing and to appropriately manage supply risk. •Raw wafer quality enhancement programs are in place to meet TSMC's technology advancement. •TSMC regularly reviews the quality, delivery, cost, sustainability and service performance of its wafer suppliers. The results of these reviews are incorporated into TSMC's subsequent purchasing decisions. •A periodic audit of each wafer supplier's quality assurance system ensures that TSMC can maintain the highest quality in its own products.
Chemicals	Air Liquide BASF Entegris Hong-Kuang Kanto PPC Merck Versum Wah Lee	These eight companies are the major worldwide suppliers of chemicals.	•Most suppliers have relocated some of their operations closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics. •All supplied products are regularly reviewed to ensure that TSMC's specifications are met and product quality is satisfactory.
Lithographic Materials	3M Hitachi JSR Nissan Shin-Etsu Chemical Sumitomo T.O.K.	These seven companies are the major worldwide suppliers of lithographic materials.	•TSMC works closely with its suppliers to develop materials that meet all application and cost requirements. •TSMC and suppliers periodically conduct programs to improve their quality, delivery, sustainability and green policy, and to ensure continuous progress of TSMC's supply chain. •Some major suppliers have relocated or plan to replicate their manufacturing sites closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics and reducing supply risks.
Gases	Air Liquide Air Products Entegris Linde LienHwa SK Materials Taiyo Nippon Sanso Versum	These seven companies are the major worldwide suppliers of specialty gases.	•The majority of the seven suppliers have facilities in multiple geographic locations, which minimizes supply risk for TSMC. •TSMC conducts periodic audits to ensure that they meet TSMC's standards.
Slurry, Pad, Disk	3M Asahi Glass Cabot Microelectronics Dow Chemical Fujifilm Planar Solutions Fujimi Kinik Sumitomo Versum	These nine companies are the major worldwide suppliers of CMP (Chemical Mechanical Polishing) materials.	•TSMC works closely with its suppliers to develop materials that meet all application and cost requirements. •TSMC and suppliers periodically conduct programs to improve their quality, delivery, sustainability and green policy, and to ensure continuous progress of TSMC's supply chain. •Most suppliers have relocated or plan to replicate their manufacturing sites closer to TSMC's major manufacturing facilities, thereby significantly improving procurement logistics and reducing supply risks.

Suppliers Accounted for at Least 10% of Annual Consolidated Net Procurement

Unit: NT$ thousands

Supplier	2016			2015		
	Procurement Amount	As % of 2016 Total Net Procurement	Relation to TSMC	Procurement Amount	As % of 2015 Total Net Procurement	Relation to TSMC
Company A	9,140,880	17%	None	7,981,126	15%	None
Company B	7,065,392	14%	None	6,452,073	12%	None
VIS	6,732,297	13%	Investee accounted for using equity method	7,148,777	13%	Investee accounted for using equity method
Company C	5,527,526	11%	None	4,579,937	9%	None
Company D	1,314,335	2%	None	5,457,120	10%	None
Others	22,403,613	43%		22,080,628	41%	
Total Net Procurement	52,184,043	100%		53,699,661	100%	

5.3.5 Quality and Reliability

TSMC's strong industry reputation stems from its commitment to provide customers with the highest-quality wafers and best service for their products. Quality and Reliability (Q&R) services aim to achieve "quality on demand" to fulfill customers' needs for time-to-market delivery, reliable quality, and market competitiveness over a broad range of products.

Q&R technical services assist customers in the technology developmental stages and product design stages to design in superior product reliability. In 2016, Q&R has worked with R&D to successfully qualify leading edge 10nm technology (the second FinFET generation) and characterize process window with Fab for mass production in 2017. For specialty technologies, ultra-low-power embedded Flash IP, stacked CMOS image sensor and ultra-high voltage GaN device also passed the qualifications and ready for production. For InFO assembly technology, Q&R worked with R&D to integrate AP (Application Processor) with IPD (Integrated Passive Device) and passed both component level and board level qualifications. With the implementation of fully automated production and process monitor data output same as Fab's quality management system, InFO technology enabled TSMC customers to introduce new products with excellent and stable production quality in 2016. Over 100 million InFO devices have been shipped to key customers without major quality or reliability issue.

For leading edge technology qualification and production ramp, Q&R developed accelerated test screening by voltage and temperature to speed up reliability failure improvement and set up the associated in-line process monitor and control. To cope with fast growing demand and increasing challenge in specialty technology, Q&R and Fab has worked together to ensure robust qualification process and production ramp. To reduce quality incidents that affect customers, Q&R and Fab also collaborated to develop a comprehensive tool and process defense system to early detect and contain issues within Fab and thus improve overall customer satisfaction.

To enhance employees' problem solving capabilities and develop associated quality system and methodology, Q&R continued to hold several company-wide symposiums and training programs such as TQE (Total Quality Excellence), DOE (Design of Experiment), SPC (Statistical Process Control) and metrology in 2016 including the promotion and training of Deep/Machine Learning. Q&R will continue the development of employees' capabilities by using new methodology to enhance TSMC competitiveness.

For incoming material quality improvement in 2016, Q&R developed and implemented 6 new quality systems and also inquired material suppliers to participate in the "National Quality Control Circle Competition" to enhance their self-improvement capabilities. For outgoing quality control, Q&R implemented auto-packing machine to eliminate manual handing and enhance InFO package quality assurance.

Failure analysis and material and chemical studies play important roles in TSMC's quality control. These capabilities are applied from the early stages of process development through assembly and packaging, including analysis of incoming materials, airborne molecular contaminants, in-depth materials characterization, and failure analysis for process development and failure analysis of customer returns. In 2016, TSMC invested aggressively in automation for transmission electron microscopy (TEM) sample preparation and imaging, which resulted in further improvement in TSMC world-class cycle times and capacity in the area. The Company also strengthened its ties with the nearby National Synchrotron Radiation Research Center to analyze advanced materials. In collaboration with customers and suppliers, TSMC continued to make significant progress in fault isolation. In particular, TSMC added the ability to remove material layer by layer for failure analysis with nanometer level accuracy. Given the changing needs of our customers and the importance of ensuring the quality of incoming chemicals and materials, in 2016, TSMC launched a laboratory to analyze precursor gases used in atomic layer deposition (ALD). With a growing presence in the IC packaging area, Q&R also bolstered failure analysis capabilities for multi-chip packages including InFO packages. These efforts will continue in 2017.

Q&R is also responsible for leading the Company toward the ultimate goal of zero-defect production through the use of continuous improvement programs. Periodic customer feedback indicates that products shipped from TSMC have consistently met or exceeded their field quality and reliability requirements. In 2016, a third-party audit verified the effectiveness of TSMC quality management systems in compliance with ISO/TS 16949: 2009 and IECQ QC 080000: 2012 certificates requirements.

5.4 Customer Trust

5.4.1 Customers

TSMC's customers worldwide have a variety of successful product specialties and excellent performance records in various segments of the semiconductor industry. Customers include fabless semiconductor companies, systems companies, and integrated device manufacturers such as Advanced Micro Devices, Inc., Broadcom Limited, Huawei Tech, Intel Corporation, MediaTek Inc., NVIDIA Corporation, NXP Semiconductors N.V., OmniVision Technologies, Inc., Qualcomm Inc., Sony Corporation, Spreadtrum Communications, Inc., Texas Instruments Inc., and many more.

Customer Service

TSMC believes that providing superior service is critical to enhancing customer satisfaction and loyalty, which, in turn, is very important to retaining existing customers, strengthening customer relationships and attracting new customers. With a dedicated customer service team as the main contact for coordination and facilitation, TSMC strives to provide world-class design support, mask making, wafer manufacturing, and backend services to provide customers an optimum experience and, in return, gain customer trust and sustain company profitability.

To facilitate customer interaction and information access on a real-time basis, TSMC-Online offers a suite of web-based applications that play an active role in design, engineering and logistics collaborations. Customers have 24/7 access to critical information and customized reports. Design collaboration focuses on content availability and accessibility, with close attention paid to complete, accurate and current information at each stage of the design life cycle. Engineering collaboration includes online access to engineering lots, wafer yields, wafer acceptance test (WAT) analysis, and quality and reliability data. Logistics collaboration provides access to data on any given order status in wafer fabrication, backend process and shipping.

Customer Satisfaction

To measure customer satisfaction and to ensure that our customer needs are appropriately understood, TSMC conducts an annual customer satisfaction survey (ACSS) with most active customers, either by web or interview through an independent consultancy.

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Complementary to the survey, quarterly business reviews (QBRs) are also conducted by the customer service team so that customers can give feedback to TSMC on a regular basis. Through surveys, feedback reviews and intensive interaction with customers, TSMC is able to maintain close touch for better service and collaboration.

Customer feedback is routinely reviewed, analyzed and then used to develop appropriate improvement plans, all in all becoming an integral part of the customer satisfaction process with a complete closed loop. TSMC uses data derived from the survey as a base to identify future focus areas. TSMC acts on the belief that customer satisfaction leads to loyalty, and customer loyalty leads to higher levels of retention and expansion.

Customers that Accounted for at Least 10% of Annual Consolidated Net Revenue

Unit: NT$ thousands

Customer	2016			2015		
	Net Revenue	As % of 2016 Total Net Revenue	Relation to TSMC	Net Revenue	As % of 2015 Total Net Revenue	Relation to TSMC
Customer A	157,185,418	17%	None	134,117,206	16%	None
Customer B	107,463,238	11%	None	134,158,421	16%	None
Others	683,289,688	72%		575,221,741	68%	
Total Net Revenue	947,938,344	100%		843,497,368	100%	

5.4.2 Open Innovation Platform® (OIP) Initiative

Innovation has always been both an exciting proposition and a challenge. Competition among semiconductor companies is growing more intense in the face of increasing customer consolidation and the commoditization of technology at more mature, conventional levels. Companies must find ways to continue innovating in order to survive and prosper. One way to accelerate innovation is through active collaboration with external partners. At TSMC this is known as the "Open Innovation®" approach. It is an "outside in" approach to complement traditional "inside out" methods. TSMC has adopted this path to innovate via its Open Innovation Platform® (OIP) initiative, which is a key part of the TSMC Grand Alliance.

The OIP initiative is a comprehensive design technology infrastructure that encompasses all critical IC implementation areas to reduce design barriers and improve first-time silicon success. OIP promotes the speedy implementation of innovation amongst the semiconductor design community and its ecosystem partners with TSMC's IP, design implementation and DFM (design for manufacturability) capabilities, process technology and backend services.

Crucial to OIP are ecosystem interfaces and collaborative components initiated and supported by TSMC that more efficiently empower innovation throughout the supply chain and, in turn, drive the creation and sharing of new revenue and profits. TSMC's active accuracy assurance (AAA) initiative is key to OIP, providing the accuracy and quality required by the ecosystem interfaces and collaborative components.

TSMC's Open Innovation® model brings together the creative thinking of customers and partners under the common goal of shortening each of the following: design time, time-to-volume, time-to-market and, ultimately, time-to-revenue. The model features:

- The foundry segment's earliest and most comprehensive EDA (electronic design automation) certification program, delivering timely design tool enhancement required by new process technologies;
- The foundry segment's largest, most comprehensive and robust silicon-proven IP (intellectual properties) and library portfolio; and
- Comprehensive design ecosystem alliance programs covering market-leading EDA, library, IPs, and design service partners.

TSMC's OIP alliance consists of 23 EDA partners, 43 IP partners, and 25 design service partners. TSMC and its partners work together proactively and engage much earlier and deeper than before in order to address mounting design challenges at advanced technology nodes. Through this early and intensive collaboration effort, TSMC's OIP is able to deliver the needed design infrastructure with timely enhancement of EDA tools, early availability of critical IPs and quality design services when customers need them. Taking full advantage of the process technologies once they reach production-ready maturity is critical to customers' success.

In September 2016, TSMC hosted an OIP ecosystem forum at the San Jose Convention Center in California, and another in October in Beijing, with keynote addresses from OIP ecosystem partners as well as TSMC executives. The forum was well attended by both customers and ecosystem partners and demonstrated the value of collaboration through OIP to nurture innovation.

TSMC's OIP partner management portal facilitates communication with our ecosystem partners for efficient business productivity. Designed with a highly intuitive interface, this portal can be accessed via a direct link from TSMC-Online.

5.5 Human Capital

Human capital is one of TSMC's most important assets.

The Company is committed to providing quality jobs with good compensation, meaningful work, and a safe work environment for its employees. Moreover, TSMC is dedicated to fostering a dynamic, effective work environment.

Based on the commitment to employees, TSMC believes that all employees should be treated with dignity and respect. In the aspect of upholding international proclaimed human rights, TSMC has initiated and implemented "TSMC Human Rights Policy" based on "A Guide for Business – How to Develop a Human Rights Policy" and is also compliance with "the International Bill of Human Rights," "The International Labour Organization's (ILO) Declaration on Fundamental Principles and Rights at Work" and "the United Nations Global Compact's Ten Principles". In addition, TSMC participates in the Electronic Industry Citizenship Coalition (EICC) as a full member.

5.5.1 Workforce Structure

At the end of 2016, TSMC had over 46,968 employees worldwide, including 4,909 managers, 20,719 professionals, 3,934 assistants, and 17,406 technicians. The following table summarizes TSMC's workforce as of the end of February, 2017:

		2015/12/31 (Note)	2016/12/31	2017/02/28
Job	Managers	4,669	4,909	4,934
	Professionals	19,645	20,719	20,972
	Assistant Engineer/Clerical	3,789	3,934	3,993
	Technician	17,169	17,406	17,443
Total		45,272	46,968	47,342
Gender	Male (%)	58.7%	59.9%	60.1%
	Female (%)	41.3%	40.1%	39.9%
Education	Ph.D.	4.4%	4.5%	4.5%
	Master's	39.2%	40.3%	40.5%
	Bachelor's	26.2%	26.7%	26.8%
	Other Higher Education	12.2%	11.6%	11.5%
	High School	18.0%	16.9%	16.7%
Average Age (years)		34.6	35.2	35.2
Average Years of Service (years)		7.5	7.9	8.0

Note: The data shown no longer include TSMC Solid State Lighting, which was sold in 2015. In addition, TSMC Solar ceased manufacturing operations in August 2015 and was merged into TSMC in December 2015.

5.5.2 Recruitment

TSMC's growth depends on the continued contributions of its dedicated employees. In order to strengthen growth momentum, the Company is dedicated to recruiting top-notch professionals for all positions available. TSMC is an equal employment opportunity employer and operates on the principles of open-and-fair recruitment. The Company evaluates all candidates according to their qualifications as related to the requirement of each position without regard to race, gender, age, religion, nationality or political affiliation.

TSMC's continuous growth requires constant talent sourcing and recruitment activities to support its business. The Company recruited over 3,400 employees in 2016, including over 2,300 managers and professionals, as well as over 1,100 assistants and technicians.

Complementary to the survey, quarterly business reviews (QBRs) are also conducted by the customer service team so that customers can give feedback to TSMC on a regular basis. Through surveys, feedback reviews and intensive interaction with customers, TSMC is able to maintain close touch for better service and collaboration.

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	Master's	39.2%	40.3%	40.5%
	Bachelor's	26.2%	26.7%	26.8%
	Other Higher Education	12.2%	11.6%	11.5%
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5.5.3 People Development

Employee development is an integral and critical factor for the growth of a company and should be goal oriented, disciplined and planned. TSMC is committed to cultivating a consistent and diverse learning environment. To this end, the Company has initiated the "TSMC Employee Training and Education Procedure" to ensure the Company's and the individuals' development objectives can be achieved through the integration of internal and external training resources.

An individual development plan (IDP) is drawn up based on the nature of the individual's job, work performance and career development path. At the same time, TSMC also actively develops talent and creates a high-performance work environment through development programs based on business objectives. The Company not only provides employees a diverse network of learning resources, including on-the-job training, classroom training, e-learning, coaching, mentoring and job rotation, but also creates a learning atmosphere through learning enablement activities in response to organization development requirements and employee capability enhancement needs.

The Company provides employees with a wide range of onsite general, professional and management training programs systematically. In addition to engaging external experts as trainers, hundreds of TSMC employees are trained to be qualified instructors to deliver their valuable knowhow in internal training courses.

TSMC's training programs include:

- New employee training: includes basic training and job orientation for new employees. Furthermore, newcomers' managers and the Company's well-established buddy system are in place to support new hires in their assimilation process in both corporate culture and work requirements.
- General training: refers to training required by government regulations and/or Company policies, as well as training on general subjects for all employees or employees of different job functions. Topics include industry-specific safety, workplace health and safety, quality, fab emergency response, languages and personal effectiveness.
- Professional/functional training: technical and professional training required by different functions within the Company. TSMC offers training courses on equipment engineering, process engineering, accounting, information technology, and so forth.
- Management training: programs are tailored to the needs of managers at all levels, including new, experienced, and senior managers; optional courses are also available.
- Direct labor training: enables production line employees to acquire the knowledge, skills and attitudes they need to perform their jobs well and to pass the certification for operating equipment. Includes direct labor skill training, technician "Train the Trainer" training, and manufacturing leader training.
- Customized training: programs are tailored to the needs of the organization and/or the people development plan.

In 2016, TSMC conducted 1,228 internal training sessions, which translated to a companywide total of 623,711 training hours with the participation of 450,756 attendees. Employees on average attended over 13 hours of training with total training expenses reaching NT$75,401,157.

Apart from internal training resources, our employees are also subsidized when pursuing external short-term courses, for-credit courses and degrees.

5.5.4 Compensation

TSMC provides a diversified compensation program that is competitive externally, fair internally, and adapted locally. TSMC adheres to the philosophy of sharing wealth with employees in order to attract, retain, develop, motivate and reward talented employees. With excellent operating performance, employment at TSMC entitles employees to a comprehensive compensation and benefits program above the industry average.

TSMC's compensation program includes a monthly salary, employees' cash bonus based on quarterly business results, and an employee profit sharing bonus based on annual profit.

The purpose of the employee cash bonus and profit sharing bonus programs is to reward employee contributions appropriately, to encourage employees to work consistently toward ensuring the success of TSMC, and to align employees' interests with those of TSMC's shareholders. The Company determines the amount of the cash bonus and employees compensation based on operating results and industry practice in the Republic of China. The amount and form of the employee cash bonus and employees' profit sharing bonus are recommended by the compensation committee to the board. In addition, the profit sharing bonus is distributed upon the approval of the board of directors. Individual awards are based on each employee's job responsibility, contribution and performance.

In addition to providing employees of TSMC's overseas subsidiaries with a locally competitive base salary, the Company grants annual bonuses as a part of total compensation. The annual bonuses are granted in line with local regulations, market practices, and the overall operating performance of each subsidiary, to encourage employee commitment and development within the Company.

5.5.5 Employee Engagement

Both local labor laws in each operation location and the fundamental conventions of International Labour Organization prohibit all forms of forced or compulsory labor. TSMC stands firmly with these protocols and has never forced labor from involuntary persons or menaced them with any penalty.

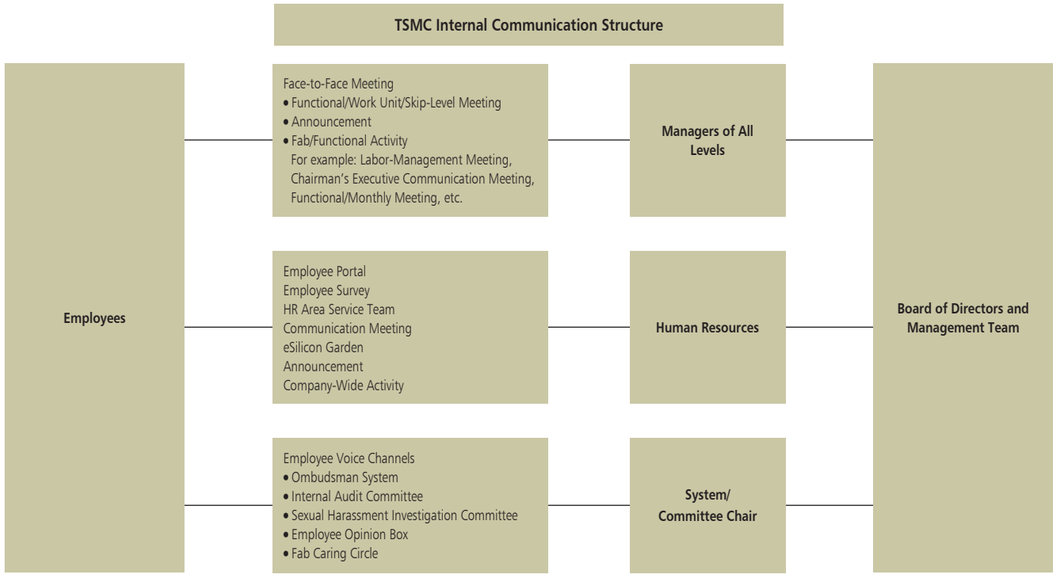
The Company encourages employees to maintain a healthy and well-balanced life while accomplishing their missions effectively. TSMC continuously implements programs to enhance employee communication, well-being, benefit, rewards and recognition. The various initiatives include the following programs:

Employee Communication

TSMC values two-way communication and is committed to keeping communication channels among management levels, subordinates and peers open and transparent. To ensure that employees' opinions and voices are heard and their issues are addressed effectively, impartial submission mechanisms, including quarterly labor-management communication meetings, are in place to provide timely support. TSMC makes continuous efforts to facilitate mutual and timely employee communication, based on multiple channels and platforms, which in turn fosters harmonious labor relations and creates a win-win situation for the Company and employees.

A host of two-way communication channels are constructed to maintain the free flow of information between managers and employees, including:

- Communication meetings for various levels of managers and employees.
- Periodic employee satisfaction surveys, with follow-up actions based on the survey findings.
- The employee portal, *myTSMC*, an internal website featuring the Chairman's talk, corporate messages, executive interviews, and other activities of interest to employees.
- *eSilicon Garden*, a website hosting TSMC's internal electronic publications providing real-time updates on major activities of the Company, as well as inspirational content featuring outstanding teams and individuals.
- The Whistleblower Reporting System owned by Audit Committee and the Ombudsman system led by an appointed vice president – two distinct channels, each with a strict confidentiality – to handle complaints regarding major management, financial, auditing, ethics and business conduct issues.
- The employee opinion box provides an opportunity for employees to submit suggestions or opinions regarding their work and the overall work environment.
- The Fab Caring Circle in each fab addresses the issues related to employees' work and personal life; the system is dedicated mainly to the Company's direct labor workers.



Core values are the foundation of the Company. As part of our practice on "Integrity," means, among other things, that TSMC abides by the law and goes above and beyond to act in accordance with the spirit of the law. "Commitment" entails providing employees with meaningful jobs, a safe working environment and competitive compensation and benefits. Under this premise, TSMC respects employees' rights entitled by global labor standards and local regulations, including the UN Global Compact's Ten Principles and Taiwan's Labor Union Act. In addition, as a member of the Electronic Industry Citizenship Coalition (EICC), TSMC adopts the EICC Code of Conduct (http://www.tsmc.com/english/csr/eicc_membership.htm) and does not impede employees' freedom of association. The principle and regulation above not only align with TSMC's goal, but also provide practical standards and measurement of implementation, which support the Company's continuous enhancement.

The relationship between TSMC management and employees has been harmonious over the years; internal communication channels are transparent and effective. The Company respects for employees' right of forming a labor union, however, no employees have pursued this avenue or issued a request to form one so far.

In 2016 and as of the date of this annual report, there have been no losses resulting from labor disputes.

Employee Benefit Programs

- Convenient onsite services: cafeterias, laundry services, convenience stores, travel, banking, and commuting assistance are accessible for employees in the fabs.
- Comprehensive health enhancement and management programs: health enhancement programs include weight control, in-fab clinic and dentist services, smoking cessation, massage service, cancer screening activity, blood donation, as well as monthly seminars to raise personal health awareness. Health management programs include post health-exam follow-up activities for abnormal cases, prevention of cerebrovascular disease, ergonomic hazards management, and maternal care and protection. Employee assistance programs include five free annual counseling sessions for mental health and financial/legal issues, with extensions available depending on the individual's needs.
- Diverse employee welfare programs: including 80 hobby clubs, 70 speeches covering various topics, Sports Day, and Family Day. In addition, holiday bonuses, marriage bonuses, condolence allowances and emergency subsidies are also available to address employees' needs.
- Premium sports centers: a variety of workout facilities available to all employees and their families, as well as exercise sessions conducted by professional instructors to improve employee wellness.
- Flexible preschool service: childcare service, operated to meet employees' work schedules, is available in three fabs in Hsinchu and Tainan.

Employee Recognition

TSMC sponsors various internal award programs to recognize outstanding achievements by employees, both individual and at a team level. With these award programs, TSMC aims to encourage continued employee development, which, in turn, adds to the Company's competitive advantage.

TSMC's award programs include:

- Medal of Honor: recognizes those who contribute significantly to the Company's business performance.
- TSMC Academy: recognizes outstanding TSMC scientists and engineers whose individual technical capabilities make significant contributions to the Company.
- TSMC Excellent Labor Award: recognizes excellent TSMC technicians and group leaders whose outstanding performance make significant contributions to the Company.
- Total Quality Excellence Award for each fab: recognize employees' continuous efforts in creating value for the Company.
- Service Award and TSMC's appreciation of senior employees: recognize senior employees' long-term commitment and dedication to the Company.
- Excellent Instructor Award: praises the outstanding performance and contribution of the Company's internal instructors in training courses for employees.
- Function-wide awards dedicated to innovation, such as the Idea Forum and TQE Awards, which recognize employees' initiative and continuous implementation of innovative practices.

Apart from corporate-wide awards, TSMC recommended employees to participate several external talent awards. In 2016, distinguished TSMC employees continued to be recognized through a host of national awards, including Outstanding Young Engineer Award, National Manager Excellence Award and National Industrial Innovation Award.

5.5.6 Retention

Continuous growth is a major component of TSMC's commitment to its stockholders and employees, and the retention of outstanding employees is crucial in fulfilling this commitment. From employee's initial orientation and adaptation to professional and career development, TSMC works proactively to provide employees with good compensation, innovative, and meaningful work, as well as a safe work environment.

Employees' overall satisfaction with the Company's efforts are reflected in the 2016 TSMC Core Values Survey, of which 97% of participants agreed that they are willing to commit fully in their work to make TSMC an even more successful company; while 95% of them concurred with the statement that they are willing to contribute their talents to TSMC and grow together with the Company for the next five years.

In 2016, the Company recorded a manageable turnover rate of 4.1%.

5.5.7 Retirement Policy

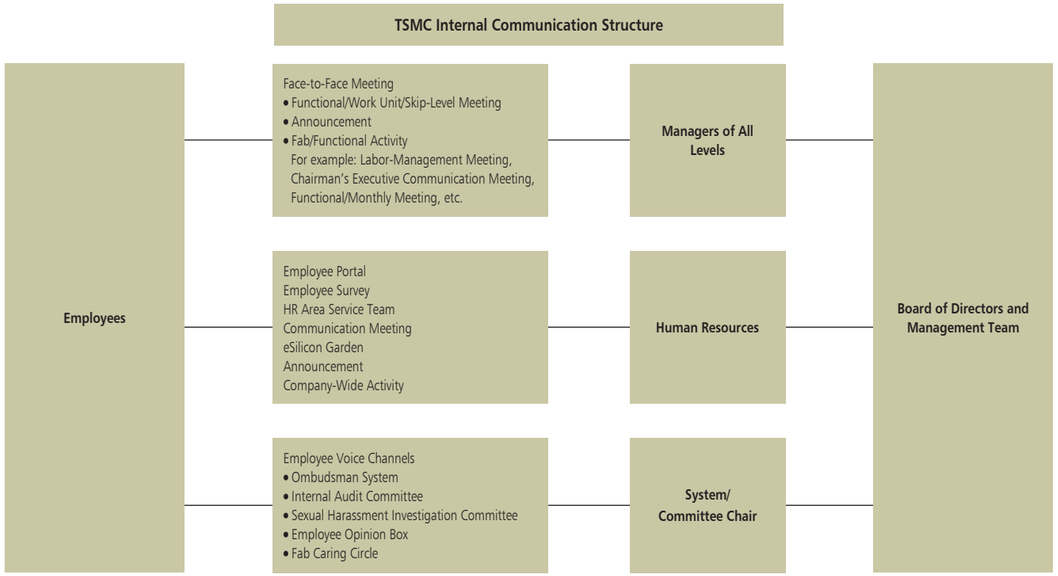
TSMC's retirement policy is set according to the Labor Standards Act and Labor Pension Act of the Republic of China. With the Company's sound financial system, TSMC ensures employees a solid pension contribution and payments, which encourages employees to set long-term career plans and further deepens their commitment to TSMC.

5.6 Material Contracts

Research and Development Funding Agreement

Term of Agreement:
10/31/2012 - 12/31/2017
Contracting Party:
ASML Holding N.V. (ASML)
Summary:
TSMC shall provide EUR276 million to ASML's research and development programs from 2013 to 2017.

Note: TSMC is not currently party to any other material contract, other than contracts entered into in the ordinary course of our business. The Company's "Significant Contingent Liabilities and Unrecognized Commitments" are disclosed in Annual Report section (II), Financial Statements, page 75-76.



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