



Key Innovative Industries in Taiwan

Communications Industry



Information Security

Next-Generation Vehicle

Communications Industry

Internet of Things

Semiconductor Industry

Biopharmacy Industry

Smart Machinery

Circular Economy

Green Energy

Service Industry

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Policy Initiatives — Digital Nation & Innovative Economic Development Program

Taiwan launched the DIGI+: Digital Nation & Innovative Economic Development Program (2017-2025) at the end of 2016 to increase the penetration of digital services from 25.8% to 80% over 9 years and thereby realize the goal of becoming a "smart nation." DIGI+ places equal emphasis on software and hardware, and builds infrastructure that will benefit digital innovation, lay a solid foundation for a digital nation, and expand the scale of Taiwan's digital economy. The main units implementing the program are introduced as below:

1

Communications Industry Development Project Office, Industrial Development Bureau, Ministry of Economic Affairs

The "Communications Industry Development Project Office, Industrial Development Bureau, Ministry of Economic Affairs" is the government think tank for comprehensively developing the network communications industry, and guides industries to invest in the development of integrated solutions. The office integrates resources and links startups and international platforms to develop innovation capabilities and talents, in hopes of enhancing the competitiveness of Taiwan's communications industry.

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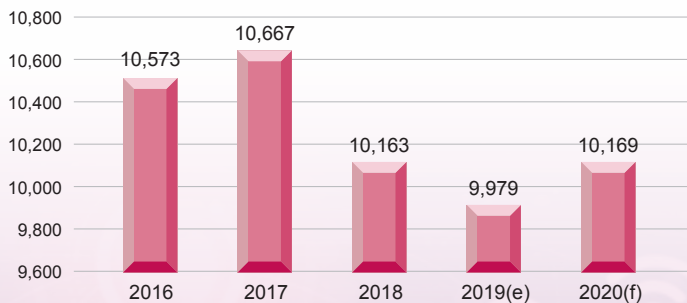
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Overview of Industrial Development

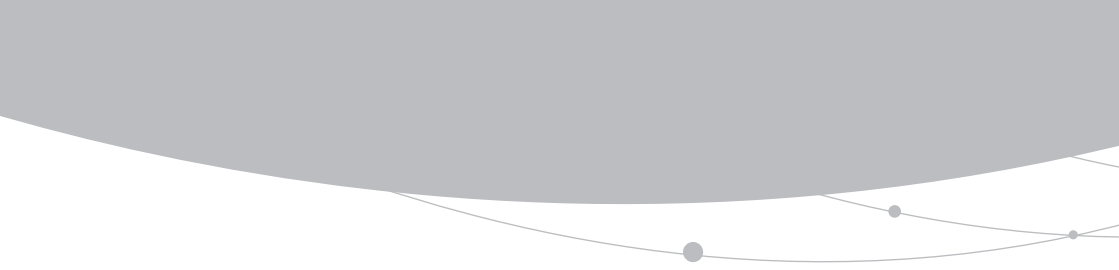
1 | Output Value |

Holding the manufacturing systems of several communications products, Taiwan is one of the key players in the global communications industry. The output value of Taiwan's communication equipment industry (including network communication equipment and personal mobile devices) was NT\$997.9 billion in 2019, dropping 1.8% from 2018. The continued expansion of demand from Internet of Things (IoT) and cloud applications, as well as the development of emerging technologies such as network virtualization, LPWAN, AI, 5G and Edge computing are expected to boost the demand for wired/wireless communication products. In 2020, Taiwan's communications industry can therefore expect to grow once again to NT\$1016.9 billion for an annual growth rate of 1.9%.



Source: Compiled by this study (Unit: 100 million NTD).

Figure 1 Production value of Taiwan's communications industry in 2016-2020



2019 is the first year of 5G commercialization. The issuing of 5G spectrum licenses by national governments, as well as the increasing maturity of the 5G industry chain spurred telecom operators and businesses in each country to invest in the roll-out of the 5G network. Taiwan's communications equipment vendors can expect to benefit from the resultant boost to demand for 5G base stations, network equipment, mobile phones, radio-frequency front-ends and other components. At the same time, new demand from people upgrading to 5G mobile phones, as well as the increasing penetration of 5G and IoT value-added applications should enhance the bottom-line of telecom operators as well.

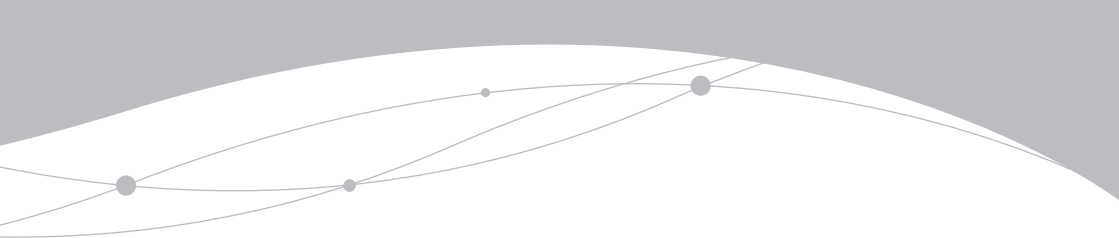
2 | Industrial Clusters |

1. Northern Taiwan

Taiwanese companies involved in the communications industry include IC manufacturers, equipment manufacturers, equipment branding companies, and telecom operators. Generally speaking, Taiwan's communications industry clusters are located in the northern parts of Taiwan, including Greater Taipei, Taoyuan and Hsinchu, which include Neihu Technology Park, Hsinchu Science and technology Park, Tai Yuen Hi-Tech Industrial Park, and Guishan in Taoyuan. Taiwan's leading communications companies are Accton Technology, Sercomm, and Wistron NeWeb. Leading telecom operators are Chunghwa Telecom, Far Eastone, Taiwan Mobile and Asia Pacific Telecom.

Accton was established in 1988 and focuses on the R&D, design, and manufacturing of Ethernet and wireless equipment. It is the leader of the open platform for hardware design, such as data centers, regional access/telecom operator-level networks, and campus/corporate networks. Accton has R&D and sales centers in Taiwan, the U.S., and China. It has over 5,000 employees worldwide¹ and reported NT\$55.401 billion in revenue in 2019.

Sercomm was established in 1992 with broadband network software and firmware R&D as its core business, but it is now a leading vendor of broadband equipment. It is headquartered in Taipei and has sales offices throughout North America, Europe, China, and the Asia-Pacific with several thousand employees



worldwide. Its products span home-use, commercial-use, telecommunications, security surveillance, and cloud applications, and main products include: Integrated Access Devices (IAD), commercial network communications equipment, FTTx fiber optic products, Cable DOCSIS equipment, Small Cell, and smart IoT solutions. Reported revenues amounted to NT\$31.8 billion in 2019.

Wistron NeWeb Corporation (WNC) was established in 1996 and specializes in the design, R&D, and manufacturing of communications products. It provides technical services for RF antenna, software/hardware, mechanism design, system integration, interface development, and product testing/certification. Its global headquarters is located in Hsinchu Science Park in Taiwan, and it has service or manufacturing locations in the U.S., U.K., Japan, China, and Vietnam. Wistron NeWeb Corporation is the global leader in notebook built-in antennas with 35% market share. The company had delivered over 300 million² satellite communications and digital home products to date, and its 2019 revenue was NT\$62.24 billion.

Chunghwa Telecom was established in 1996, and was restructured from the business department of the Directorate General of Telecommunications, Ministry of Transportation and Communications at the time. It is the largest general telecom operator in Taiwan, and its scope of business covers fixed network communications, mobile communications, and broadband access and Internet. It also provides corporate customers with ICT services using its big data, information security, cloud, and network data center technologies. Chunghwa Telecom is also developing emerging technology services such as IoT and AI³. The company's 2019 revenue was NT\$207.52 billion.

¹ Official website of Accton Technology: <https://www.accton.com.tw/accton/>.

² Official website of Wistron NeWeb Corporation:
<http://www.wnc.com.tw/index.php?action=about&cid=1>.

³ Official website of Chunghwa Telecom: <https://www.cht.com.tw/zh-tw/home/cht>.

2. Central and Southern Taiwan

Communications companies in central Taiwan are mainly automobile communications electronics and consumer electronics manufacturers such as Merry and Jabil. Even though southern Taiwan is home to Kaohsiung Software Technological Park and Southern Taiwan Science Park, occupancy by communications companies are lower than northern Taiwan.



Potential Investment and Collaboration Opportunities in Taiwan

1

Leveraging Taiwanese Industry Clusters to Invest in Technological R&D and High-end Manufacturing

Taiwan's communications companies have both manufacturing and global logistics capabilities. Their strengths include networking IC, parts and components, touch panels, and system integration. The industrial chain is relatively complete. Therefore, Taiwan's complete communications industrial cluster can improve the performance of R&D centers and manufacturing bases established by foreign companies in Taiwan. In upstream base components for example, Taiwan Semiconductor Manufacturing Corp. (TSMC) has partnered with leading IC vendors such as Qualcomm and Ericsson to develop and produce 5G IC on an OEM basis. Taiwan's MediaTek has now launched the M70 5G Modem IC and is working on 5G System-on-Chip (SoC) products that are compatible with both Sub-6 GHz and millimetric bands. WIN, Wha Yu, Universal Microwave Technology (UMT), Advanced Wireless Semiconductor (AWSC) and other companies are working on power amplifiers, antennae and radio-frequency components. In the midstream, Taiwanese manufacturers are working on networking and hardware infrastructure (switches, routers, micro-cells, consumer premise equipment (CPE) and set top boxes (STB)). For downstream end-user applications, Quanta, Advantech and Gigabyte are developing virtual platform servers; Askey, WNC, Jorjin, and HTC are developing wearable devices. In the future, foreign companies can invest in business opportunities offered by Taiwan's communications industry through collaborative R&D and technology transfers.



2

Taiwan as a Base for the Development of 5G Business Models and Innovative Applications

Due to the rapid development of mobile communications technologies worldwide, 5G services will become a key point in observing the global communications industry's development in 2020. Even as other countries around the world launching their own 5G development efforts, Taiwan already plays an important global role thanks to its edge in the development of key IC, modules, and terminal products. Taiwanese companies will have an opportunity to connect central office and terminal end, then gradually complete the industrial value chain as they integrate 5G, cloud computing, IoT, and AI technologies, thereby becoming system solution suppliers.

In addition, local telecom operators are all actively building their own 5G testing regions to develop a new business model for 5G. The availability of open networks and communications infrastructure will hopefully encourage vendors to experiment with different solutions. Chunghwa Telecom for example has partnered with KingwayTek to transform Hutoushan Innovation Hub into a 5G pilot trial site for the development of varied application scenarios. Taiwan Mobile has built a team of 6 local start-up to enable 8 5G application services and scenarios for baseball including 3D instant replay, AR virtual opening pitch display, and 4K mul-angle live streams. Technology is used to provide people watching baseball in the stadium or online with brand new services. The intelligent baseball field will show people what "real" 5G applications can do. Foreign companies can collaborate with Taiwanese companies on the development of 5G application services. The integration of AI, IoT, and AR/VR technologies in particular should lead to the development of further business opportunities in vertical applications.



3

Partnering with Taiwan to Take Advantage of Emerging Opportunities due to COVID-19

The COVID-19 pandemic spurred new ways of working and learning such as working from home, tele-education and online conferencing in 2020. The rise of "stay-at-home economy" from remote purchasing by consumers also created demand for network communications equipment and communications software. A convergence of the communications and medical industries to develop electronic quarantine and tracking systems in response to the pandemic may become a future trend as well. As a key hub of the global communications industry, Taiwan is home to a number of communications hardware manufacturing systems. Foreign companies can take advantage of these business opportunities through collaborative R&D and investment in Taiwan.



5G

Investment Incentive Measures

1 | Tax incentives |

Taiwan's profit-seeking enterprise income tax rate is 20%. To encourage foreign companies to invest in Taiwan, support industrial innovation, and promote industry-academia collaboration, foreign companies are eligible for the following preferential taxes (Table 1):

Table 1 Preferential taxes

Item	Incentives
R&D and introduction of technology or mechanical equipment	<ul style="list-style-type: none">• Up to 15% of the company's R&D expenditures may be deducted from its profit-seeking enterprise income tax for current year.• Royalty payments to foreign companies for imported new production technologies or products that use patents, copyrights, or other special rights owned by foreign companies is, with the approval of the Industrial Development Bureau, MOEA, exempt from the corporate income tax.• Imported machinery which local manufacturers cannot produce are eligible for duty-free treatment.
Technology investment / Stock-based employee compensation	<ul style="list-style-type: none">• The worth of shares acquired through technology investment/stock-based employee compensation can be excluded from the taxable income for that year (up to NT\$5 million). In addition, those that meet related criteria are eligible for reduced taxes based on "acquisition price" or "transfer price," whichever is lower.

Item	Incentives
Investment in smart machinery / 5G	<ul style="list-style-type: none"> ● Smart machinery: Automatically scheduled, flexible, or mixed-model production lines that utilize big data, AI, and IoT. ● 5G: Related investment projects include 5G communication systems, and new hardware, software, technology, or technical services. ● For investments of no less than NT\$1 million and no more than NT\$1 billion, either "5% of investment spending deducted from profit-seeking enterprise income tax (current FY)" or "3% of investment spending deducted from profit-seeking enterprise income tax, if total spending spread over three years" may be selected, but the total amount deducted may not exceed 30% of corporate income tax that year. ● The applicable periods are January 1, 2019 through December 31, 2021 (smart machinery) and January 1, 2019 through December 31, 2022 (5G).
Foreign Special Professionals	<ul style="list-style-type: none"> ● Foreign special professionals who meet criteria are eligible for a 50% deduction of total income tax for amounts exceeding NT\$3 million.
Setting up operations in industry parks	<ul style="list-style-type: none"> ● Companies that set up operations in export processing zones, science industrial parks, or free trade ports are eligible for exemptions on import duties, commodity tax, and business tax for the import of machinery and equipment, ingredients, fuel, materials, and semi-finished products for their own use.
Others	<ul style="list-style-type: none"> ● Companies that use undistributed earnings to engage in substantive investments may exclude the amount when calculating their profit-seeking enterprise income tax.

2 | Subsidies |

1. The Global R&D Innovation Partner Program

Some foreign companies have a high degree of complementarity with Taiwan's industries. To encourage them to engage in R&D and innovation activities in Taiwan, such companies, after gaining approval from the MOEA, will be eligible for subsidies of up to 50% of total R&D expenditures if they: (1) have technologies that are not yet mature in Taiwan or overseas, and could create strategic products, services, or industries over the course of future industrial development; (2) have potential to help Taiwan produce leading technologies or significantly enhance the competitiveness and increase the added value of important industries; or (3) engage in key and common technology R&D, vertical or horizontal technology integration, and can create an industrial value chain.

2. Integrated R&D Program

Companies, once approved by the MOEA, will be eligible for subsidies of no less than 40% but no more than 50% of total project funding if they: (1) engage in key and common technology R&D, vertical or horizontal technology integration, and can create an industrial value chain; (2) establish industry standards, protocols, or platforms; or (3) establish applications, services, and innovative business and marketing models with technological content, and increase industry's added value.

3. Taiwan Industry Innovation Platform Program

The MOEA Industrial Development Bureau and the Ministry of Science and Technology are jointly implementing the "Taiwan Industry Innovation Platform Program" to guide industries to develop towards greater value, and to encourage companies to enter high-end product application markets to increase industry's overall added value. For companies owning R&D teams in Taiwan, the program provides 40-50% of the funding required for theme-based R&D projects, and up to 40% of funding for R&D projects proposed by the companies themselves.



Successful Examples of Foreign Companies

1 | R&D Collaboration on Emerging Technologies and Applications

US-based Cisco partnered with Taoyuan City Government to establish a "Cisco Innovation Center" for smart solutions in Taoyuan's Chingpu district at the end of 2019. The innovation center will serve as a R&D hub for IoT in Taiwan. A number of Taiwanese companies including Delta Electronics, MiTAC and Syscom had already signed on to the project. This year (2020), Cisco also formed a partnership with ITRI with the support of Industrial Development Bureau to establish the first 5G open architecture network platform at the Innovation Center. This will provide an interface with the Taiwanese communications industry for the co-development of a dedicated 5G open architecture network and eco-system. In the future, white-label equipment and applications produced in Taiwan can be marketed internationally through Cisco's global sales network.

In January 2019, Qualcomm formally established a 5G test lab in Taiwan for 5G radio-frequency IC testing. Other labs including the 5G module test lab, biometric sensor excellence center and mmWave excellence center were also set up. The lab is now collaborating with testing service providers such as KYEC and MPI. Another leading IC manufacturer Broadcom established an IPO office, R&D and design center, and head office in Taiwan, creating collaboration opportunities through technology exchanges and IC OEM.

Other collaborations included the completion of joint 5G testing by Nokia and Mediatek. At the end of 2019, Nokia also announced that it is working with Intel to release a 5G baseband IC developed by Mediatek based on specifications issued by Intel. Dell and HP are expected to introduce the new IC on their 5G notebooks in early 2021. Europe's multinational telecom operator Vodafone selected Accton subsidiaries Edgework Networks and Alpha Networks, along with Delta Electronics subsidiary Delta Networks to develop the disaggregated cell site gateway (DCSG). Micron is expanding its investment in Taiwan to improve the technology and yield of its advanced memory production processes in anticipation of memory demand from 5G.



2 | Cooperation on talent development |

To help industries discover local talent with creativity and design application abilities, the Industrial Development Bureau, MOEA established a competition mechanism with themes set based on development trends and needs of the communications industry. Since 2002, themes have included wireless software, antenna design, smart handheld device user interface design, wearable and IoT device development, and smart IoT applications. The 2020 Mobile Heroes competitions focused on IoT Future Challenge, 5G Multi Antenna System Innovation and Design Competition, 5G Pioneering Innovative Application Competition, and the Connectivity International Award for international submissions aimed at connecting international innovation with local industry talent. Over 8,000 students and members of society have participated in the competitions to date. Leading international communications companies such as Google, Qualcomm, Microsoft, AWS, Sigfox and Cisco had also taken part as well. For example, Sigfox provided development modules for free to encourage contestants to develop innovative IoT applications using Sigfox technology. It also organized Hacking House to guide excellent startup teams in Taiwan to participate in its global IoT product development project.



In addition, the IDB Mobile Heroes program also signed a memorandum of understanding with the Canadian Technology Accelerator in 2020. The signing of the MOU was witnessed by Former MOEA Minister Jung-chin Shen and Canadian Trade Office in Taipei Executive Director Mr. Jordan J. Reeves. Under the MOU, the two parties will recruit overseas start-ups to meet with communications and vertical integration companies in Taiwan in order to create new opportunities for Taiwanese-Canadian cooperation.



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