

**NCC-Y110-005**

**A study of the 5G network service  
types and the related  
telecommunications regulations and  
policies**

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## **I. Introduction**

The fifth generation of mobile communications technology (5G) is mainly characterized by Enhanced Mobile Broadband (eMBB), Massive Machine Type Communications (mMTC), and Ultra-Reliability and Low Latency Communications, URLLC). The application of the above three technical capabilities will not only bring consumers a different mobile network experience, but also allow telecommunications operators to be more flexible in commercial applications.

As 5G technology uses higher frequency bands to obtain a faster transmission rate, it also requires more intensive construction of base stations, which means higher construction costs to the telecommunication operators, and therefore leads to the cooperation between or among the telecommunication operators.

In addition, 5G technology has deconstructed the past hardware-based mobile network configuration model, such as the introduction of a service-based architecture of core network architecture, a network slicing technology that meets diversified needs, a software-defined networking technology driven by the explosive application demand of emerging businesses, and the technology of multi-access edge computing which

greatly reduces latency issues, etc. The above technologies enable the operators to achieve rapid expansion and flexibility of network functions. As the 5G network gradually moves towards an open architecture, the 5G system is expected to integrate services from a variety of outsourced or third-party providers. It then brings comprehensive changes to the structure, business model, and value creations to telecommunications operators.

In Taiwan, Telecommunications Management Act was promulgated by the Office of the President on June 26, 2019. In view of the fact that 5G technology will bring about changes in the business models of telecommunications service, the Telecommunications Management Act has clearly stipulated that the telecommunications operators should clearly disclose the conditions, quality and data management methods of various emerging services provided by the telecommunications operators.

Taiwan has completed the release of the first 5G spectrum in 2020, and the operators have been building the 5G networks and developing 5G commercial services in accordance with laws and regulations. In order to understand the impact of 5G technology on provision of 5G services, and the responses of regulatory agencies' internationally, this research aims to

analyze the development types of 5G services in major countries and their related regulatory issues, the latest practices and development trends of regulations and/or policies. In turn, it can provide recommendations on future policies to the authorities of Taiwanese government.

## **II. Methodology**

This study puts forward suggestions on the recommendation of telecommunication policies through the adoption of various research methods, including the methods of literature review, comparative analysis, case study, focus group discussion and in-depth interview.

### **1. Literature review**

Some countries/area were selected in order to analyze the development of 5G networks and commercial services, the 5G business models and the involved companies, the legal issues or regulations, etc. The selected countries includes: United States, the United Kingdom, the European Union [overall], European countries [Germany, Spain], Australia, South Korea, Japan, Singapore, China and Taiwan.

### **2. Comparative analysis**

Based on the research results of literature reviews, a comparative analysis was conducted to compare the 5G development strategies, types of 5G applications and services, types of cooperation in the telecommunication industry and cross industries, legal issues, and related regulations/policies for 5G services and the adopted business models for various countries.

### **3. Case study**

The research method of case study was adopted to investigate the different types of business models (B2X or B2B2X) carried out by major telecommunications companies in various countries, as well as the network architecture adopted to deliver the 5G services under the new business model. Seven cases (in seven countries) were analyzed to sketch out the different types of business models that are varied with the involved co-operators (such as telecommunications operators, service providers, equipment providers, venue, etc.), target customers and applications. In addition, this study used case studies to examine the cooperation of telecommunication operators (mainly in the forms of merger or joint venture), the legal issues and the regulatory responses in

various countries. Six cases in the U.S., EU, UK., German, South Korea and Singapore were investigated and analyzed.

#### **4. Focus Group**

Two focus group discussions were held to gather the insights from domestic experts and scholars, with regards to the 5G development strategies, potential applications of 5G services, regulatory issues and the recommendations on regulations/policies. In addition, before the submission of the final report, a presentation was made to share the research findings to stakeholders and exchange opinions with participants.

#### **5. The in-depth interview**

A semi-structured interview was conducted to the major 5G operator in Taiwan to understand the current 5G deployment status (including both of the technology and business aspects), the challenges of promoting 5G services and applications, and the recommendations on regulations and policies to facilitate the 5G deployment and applications. The interviews helped to provide complemented information gathered from the above

research methods, enabling this study to further draw conclusions and suggestions.

### **III. The development of 5G technology and the new business model**

The capabilities of 5G technology include millimeter wave, network function virtualization (NFV), software-defined network (SDN), multi-access edge computing (MEC), network slicing and other functions. Through the use of above technologies, it can enjoy the benefits of large bandwidth, high speed, low latency, large connection, etc., and then expand the potential applications of mobile communications. In addition to the personal communications, 5G technology can also realize the interconnection among things. Technical standards organization of 3GPP continues to discuss related technical specifications, such as 5G/NR technology, physical layer specifications, related applications such as V2X. The technical specifications and technical reports released by 3GPP have been helping to achieve better telecommunications network effects and facilitate the realization of 5G applications.

The adoption of 5G technology, combining with the use of artificial



intelligence, drones, robots and other technologies, can be widely applied in various industries. Because end users are looking for integrated information and communication technology solutions, the deployment of 5G also drives changes in the business model for telecommunication companies. The business models may be shifted from the B2C or B2B to B2B2X, where X may be users with different needs such as consumers, enterprises, governments, schools, etc. Under the B2B2X business model, the role of the telecommunication operator has also changed from being a connection service provider or network developer to a service facilitator or even a service creator.

No matter of being a service facilitator or a service creator, in order to meet the needs of different industries, telecommunications companies need to work with different service providers to deliver innovative vertical application services. Therefore, telecommunications companies and related equipment or services providers will cooperate more closely, and expand the realization of innovative 5G applications through the B2B2X business model.

Accordingly, this research analyzed the development of 5G services, 5G technology and business model applications, and cross-

telecommunications industrial cooperation models in major countries/regions (the United States, the United Kingdom, the European Union, Germany, Spain, Australia, South Korea, Japan, Singapore, Mainland China, and Taiwan). In addition, the disclosure of information related to telecommunications service conditions, and the relevant legal issues and tripartite rights and obligations under the application of different business models were also analyzed through case studies.

#### **IV. Telecommunication regulations and policies**

As for telecommunication regulations and policies, this research analyzed the relevant telecommunications regulations and policies for 5G services in the major countries/area (the United States, the European Union, the United Kingdom, Germany, South Korea, Singapore). The researched telecommunication regulations and policies contain the following:

- information disclosure regulations (such as telecommunications service conditions, telecommunications network quality, data management and conditions);
- cooperation between telecommunications operators in the form

of mutual investment, equity transfer, merger and joint venture, etc.;

- network neutrality issues involved in tailor-made services;
- market definition and fair competition issues under the business models of B2X and B2B2X.

## **V. Main Findings**

Based on the analysis results, the main findings are summarized as below.

### **1. The development of 5G commercial service and application types**

Most selected countries in this research mainly use the mid-frequency band to develop the 5G applications. In terms of 5G commercial application types, 5G is widely used in sports events, retail, tourism, transportation, education, smart manufacturing, smart medical, games, live broadcasting, exhibitions and other fields in selected research countries.

### **2. 5G technology development and applications**

5G is mainly used non-standalone (NSA) architecture currently, and many innovative applications can only be realized under the standalone (SA) architecture. Currently, the operators mainly use network slicing, MEC, and NFV technologies to achieve similar performance as that of SA network architecture.

### **3. 5G business model of cross-industry cooperation**

Telecommunication operators are focused on working with companies in other industries to develop various types of vertical applications. Therefore, the business model is dominated by B2X or B2B2X. It can be seen from the B2B2X business model that the value chain of integrated service may involve the cooperation of multiple companies. As a result, in the process of service delivery, the telecommunication operators may not play the leader role, but may be the role of network developer or service facilitator instead. The B2B2X model shows the trend of integration across the ecosystem. The final X may be an enterprise, or it may extend to consumers or end users.

### **4. Cross- industry cooperation and tripartite rights and obligations**

The characteristic of the new 5G business model is that the telecommunication operators and different service providers jointly launch application/services, mainly through the B2B2X business model. In terms of the tripartite rights and obligations under B2B2X model, the rights and obligations between the telecom operator (B) and the cooperated enterprise (B) can be clarified by contract, and those between the user (X) and the enterprise (service provider) should be handled by the service provider.

## **5. The development strategy of 5G commercial service**

In practice, it can be seen that telecom operators widely allied with enterprises in various industries, and adopt the B2B2X model to promote the vertical applications by the use of 5G technology. In order to promote 5G vertical applications, the following strategies are suggested:

- Government should encourage the cooperation among various players, including telecommunications operators, equipment and hardware providers, service providers, field operators, etc.
- Facilitate the 5G vertical applications through the adoption of POC (Proof of Concept) and POB (Proof of Business) to

experiment with innovative application services.

- The government should provide fields that allow the companies to experiment the 5G vertical applications.
- A lift of laws and regulations to allow the launch of innovative application services easily.
- Currently the authority (NCC) is mainly responsible for the supervision of telecommunications industry. Taiwanese government is currently planning to set up a new Ministry of Digital Development to lead and facilitate the digital economy development in Taiwan. In the future, once the new ministry has been set up, it is expected to render more governmental support for the development of telecommunications industry and related 5G applications.

## **6. Consumer information disclosures by telecommunication operators**

In terms of information disclosure, it is different for consumer and corporate customers, depending on the business model of the telecommunication companies. For consumers, there are regulations for

the disclosure of information by telecommunications companies about telecommunications services.

Therefore, as for consumers, the regulation applied for the disclosure of information by the telecommunication companies to consumers is the same; no matter it is 5G or 4G service. The operators should disclose the consumer information such as plans (including tariffs, data management, and/or network speed, etc.). For corporate customers, regardless of whether it is a B2X or B2B2X model, the relevant information disclosure and network quality can be arranged through a contract signed by both parties.

## **7. Related legal issues**

Telecommunication companies which provide telecommunication services or related applications in various countries all abide by relevant laws and regulations. In Taiwan, regulations such as "Telecom Management Act", "Personal Data Protection Act", "Consumer Protection Act" and "Fair Trade Act" clearly stipulate consumer rights protection and fair competition requirements, and the protection is quite sufficient for the consumers.

## **8. Requirement of information disclosures to consumers by national authorities**

The authorities of various countries have regulations on disclosure of consumer information, such as telecommunications service conditions, telecommunications network quality, data management and conditions.

The regulations requiring information disclosures to consumers in major countries mainly focus on appropriate information disclosure. In terms of the quality of telecommunication services, most countries encourage or require the operators to disclose related information, or provide service quality information periodically. Singapore's Infocomm Media Development Authority (IMDA) has evaluated whether it is necessary to introduce a QoS/QoE framework for 5G services to protect the rights of consumers and key services, but the industries has different opinions on this issue. In terms of data management requirement, most of the selected countries in this research require that the operator should inform the consumers before the usage of data is near the limit to prevent bill shock to consumers.

## **9. Related issues of mutual investment, equity transfer, merger and**



## **joint venture in the telecommunications industry**

In terms of the cooperation between different operators, most cases identified in this study were merger cases, or joint venture companies that two operators jointly bid for spectrum or developed, deployed and operated 5G mobile network. When evaluating whether or not to approve related cases, the competent authorities of various countries still mainly evaluated from the perspective of market competition and the impact of consumer interests as a result of the merger or set up of joint venture. The evaluation was conducted case by case, depending on the specific context of each country.

## **10. Network neutrality**

The EU Open Internet Regulation (2015 / 2120 specification) does not allow network service providers to prevent, restrict and discriminate network traffic. However, due to different technical requirements for the quality in different services, appropriate traffic management is allowed. In Korea, according to the guidelines for network neutrality and network traffic management recently revised by Ministry of Science and ICT (MSIT), the applicability of network neutrality to quality assurance

services based on network slicing and other technologies in the future will depend on the service attributes applicable to the technology. Singapore's policy on network neutrality basically allows the provision of niche service or differentiated network services.

### **11. Market definition and fair competition issues under B2X and B2B2X.**

The 5G vertical applications in the forms of B2X or B2B2X are still in the exploratory stage. The analysis showed that the market definition in selected countries remains on the traditional telecommunications market. The principles and analysis approach of market definition and market analysis currently remain the same.

### **12. Supervision and policy changes from 4G to 5G**

In view of the changes in the supervision and policies from 4G to 5G, at present, there are no major adjustments found in selected research countries. However, it found that the authorities were more lenient to the cooperation between telecommunications operators. For example, the authorities in the United States approved the T-mobile/Sprint merger. The

main reason was that the merger can accelerate the 5G deployment in the U.S. Another example is that the South Korean government required their three telecommunications operators to cooperate to deploy 5G network in the remote areas.

## **VI. Recommendations**

Based on the above findings, this research proposes short-term, medium and long-term recommendations below.

### **1. Short-term recommendations**

#### **1) Release experimental fields to promote 5G applications and commercial cooperation of industries**

It is recommended that the government should assign airports or harbours as 5G pilot test points for 5G applications, such as IoT or smart transportations. In addition, the government can provide project subsidies to those who involve in the cross-industry cooperation in the 5G experimental field to effectively link field operators, telecom operators, and service providers.

#### **2) A lift of personal data protection laws to promote the data**

## **applications**

Telecom operators in various countries develop B2B2X business models and abide by relevant laws and regulations, including personal data protection and consumer protection laws. The personal data protection law in Taiwan is very strict, and the scholars and experts suggest that laws or policies should be lifted to promote the application of data. The establishment of an authority centralized in charge of personal data protection may not be achieved in the short term, however. In the short term, it may be possible to refer to the mechanism of Institutional Review Board (IRB) used in medical system. That is, if the company wants to use user data to provide a specific service, it can propose a plan which can be reviewed through such mechanism. Therefore, it will benefit the use of customer data.

### **3) Under B2B2X model, it is recommended to use contracts to regulate the rights and obligations for the companies of cooperation**

The B2B2X business model of 5G involves cooperation between telecom operators and different service providers. Since the details of cooperation between enterprises may involve business secrets, and the 5G

business model currently is under development, it is recommended that the rights and obligations (such as the degree of information disclosure and service quality) between telecommunication operator and service provider should be regulated through the contract signed by the companies involving in the business cooperation.

**4) In response to the transition from the Telecommunications Act to the Telecommunications Management Act, it is recommended that relevant regulations regarding the standard form contract for telecommunications service to be adjusted**

In Telecommunications Management Act, it only regulates that the telecom operators should provide a standard form contract to consumers, without stating any fine charged if the operators breach the contract. Therefore, it is recommended to revise Article 79 of the Telecommunications Management Act by adding fines if the operators do not abide by the standard form contract to provide better protection to the consumers.

**5) Strengthen the coordination mechanism between authorities and speed up the review schedule**

Merger cases concerning fair competition are usually co-reviewed by the National Communications Commission (NCC) and Fair Trade Commission (FTC) in Taiwan. However, the current laws and regulations do not stipulate that the coordination mechanism about review procedure between NCC and FTC. It is recommended that the coordination mechanism between NCC and FTC be strengthened, and the procedures of the coordination mechanism should be clarified. For example, NCC and FTC can share the reviewing information, schedule and progress to speed up the review process.

## **2. Medium and long-term recommendations**

### **1) Continue to observe the development of international 5G technology applications and business models**

At present, 5G is widely used in sports events, retail, tourism, transportation, education, smart manufacturing, smart healthcare, games, live broadcasting, exhibitions and other fields in the world. 5G can combine AR/VR, AI, cloud, big data and other technologies to develop diversified application services. However, the 5G deployment and applications are mainly based on NSA architecture currently. Although

some operators started to deploy 5G SA networks internationally, the overall ecosystem is still immature. Therefore, it is recommended to observe the development of 5G applications and business models internationally, followed the progress of 5G SA network deployment.

**2) Continue to maintain a fair and competitive industrial environment, promote cross-industry cooperation and encourage innovation**

At present, 5G service in Taiwan hasn't been launched for a long time. Many business models are still at the exploratory stage, and most of them are experimental cases that have not been commercialized yet. It is recommended that the authority should put the focus on the management of frequency interference. For emerging applications through B2B or B2B2X models, it is recommended to have an ex-post regulation, facilitating the launch of new applications/business.

**3) Continue to track the trend of digital economy development and the related impact**

The analysis result found the focus of market definition in selected

countries was still at the network level. That is, the market definition and market analysis in principle follows the existing framework.

It is recommended that while being at the early stage of developing the 5G applications, the authority should continue to observe the market development and market competition with an ex-post regulation. In addition, in Singapore, IMDA conducted public consultations on “Converged Competition Code for the Media and Telecommunication Markets”. IMDA proposed adopting a "Market-by-Market" approach for market review, and pointed out that it would continue to monitor developments in digital economy and further make public consultant if there is a need to change the competition framework. It is recommended to watch the subsequent development and the related impacts on the policy and regulations.