Review and Analysis of Thailand's Competitiveness in ICT

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***Abstract*—Before 3G spectrum in the 2.1 GHz band was allocated through auctions on 16 October 2012 in Thailand, there had never been any spectrum allocated since the year 2000. That is to say, spectrum in the 2.1 GHz band has not been in operations for over 12 years. After the allocation of spectrum has made further allocation of spectrum, Thailand has climbed to several positions in NRI rankings: at 74th globally in 2013, 67th globally or 5th regionally in 2014, and 67th globally or 3rd regionally after Singapore and Malaysia. Therefore, it is obvious that spectrum allocation is one of the mechanisms that bring about economic growth, relying on the resources available in the country. This paper presents several Thailand's ICT competitiveness rankings. The paper aims to analyze Thailand's status against some countries. The paper also gives recommendations to move up the ranking for next year.**

***Index Terms*—Thailand, ICT, competitiveness, analysis.**

I. Introduction

The country's competitiveness is considered the index widely used for comparative evaluation of potential and competencies in each aspect among all countries worldwide. Nowadays, there are many leading agencies responsible for setting up national competitiveness rankings as follows:

A. Measuring the Information Society Report 2013

Thailand's ICT technology has developed continuously, considered at the intermediate level compared with those of other ASEAN countries. In relation to this, the ITU has revealed the annual survey results regarding ICT-society indices or "Measuring the Information Society Report" which is published annually. The Measuring the Information Society Report 2013 derived from the 2012-data demonstrates how the capability in the telecommunications industry of each country appear, at the global community level. This indicates the country's development success in various aspects, for example, competition and fee rates of telecommunications services, Internet penetration rates, rates of mobile phone consumption. Furthermore, the ITU's report also discloses another global trend of telecommunications industry which points out that mobile devices are the vital factors that help with easier access to the Internet. This can be observed from the information which has been recorded since 2007 up to this time indicating that, in developed countries, the population of fixed Internet access has slightly increase from 18 percent up to 27.5 percent of the total populations, whereas the populations using the Internet via mobile devices, on the contrary, achieve a leapfrog growth from 20 percent to 83.7 of the total populations during the same period [1].

From the Measuring Information Society Report 2013, it is found that Thailand has attained the highest level in the development of broadband Internet usage. It can climb up by 34 places in the ranking, from 105th position last year to 71st position this year, stemming from the allocation of IMT spectrum in the 2.1 GHz band, the operation of 3G networks, fierce competition among mobile phone operators as well as the rapid growth in mobile Internet. This also influences Thailand's position in the country rankings of ICT Development Index (IDI) to climb up into 81st position (10 places higher than the former one) among166 countries worldwide. According to this, Thailand's ICT development has been elevated to the global average level and takes 10th place among Asia-Pacific countries or 4th place among ASEAN countries, with the household Internet penetration rate lifted up from 17.5 percent to 29 percent. This demonstrates Thailand's ICT performance which has improved rapidly and tends to be continuously developed in the future, especially in the wireless telecommunications industry where over 7 million new mobile phone subscribers, 28 million wireless broadband subscribers, and the mobile phone penetration rate standing at 138 percent of the total population are attracted, based on the research conducted in 2013. During this year, all mobile phone operators try to accelerate the expansion of mobile networks to cover all inhabited areas of Thailand [1], [2].

The indices showing the level and development of ICT systems or ICT Development Index (IDI) are annually measured subjecting to 11 criteria which can be sorted into 3 groups as follows:

1) Criteria for ICT penetration rate accounting for 40 percent among others
2) Criteria for ICT utilization rate accounting for 40 percent among others
3) Criteria for levels of technological competencies accounting for 20 percent among others

TABLE I: Most Dynamic Countries – Changes between IDI 2013 and 2012

Change in IDI ranking			Change in access ranking			Change in use ranking		
IDI rank 2013	Country	IDI rank change	Access rank 2013	Country	Access rank change	Use rank 2013	Country	Use rank change
32	United Arab Emirates	14	47	Oman	16	71	Thailand	34
91	Fiji	12	101	Cape Verde	7	72	Fiji	24
93	Cape Verde	11	124	Gambia	7	142	Burkina Faso	13
81	Thailand	10	22	Qatar	6	79	Cape Verde	12
52	Oman	9	28	Estonia	5	24	United Arab Emirates	12
34	Qatar	8	64	Seychelles	5	134	Congo (Rep.)	11
38	Belarus	5	97	Albania	4*	111	Bhutan	8
69	Bosnia and Herzegovina	5	38	Belarus	4*	30	Qatar	8
78	Georgia	5	112	Bolivia	4*	61	Antigua & Barbuda	7**

B. Networked Readiness Index

The rankings of telecommunications networked readiness are conducted by the World Economic Forum (WEF) on the

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basis of Networked Readiness Index (NRI) and the opportunities for making use of ICT technologies to develop and increase the country's performance in economic competitiveness. It has ties many countries at the ICT competitiveness rankings since 2011 based on three major factors: firstly, the environmental condition of markets, policies, regulation, and infrastructures; secondly, readiness in ICT application in the aspects of the popular sector, the business sector, and the public sector; lastly, ICT usage and real communication in terms of the popular, business, and public utilization [3].

Prominent features of NRIs are as follows:

1) The indicators are initialized through calculating a great number of variables in direct relation to ICTs, the environment characterizing usability, and ICT readiness.
2) The rankings cover a large number of countries. That is to say, there were only 72 countries listed in the rankings in 2001, such number has multiplied year after year: 144 countries in 2013 and 148 countries in 2014, recently.

Based on the ranking results provided by the NRI during 2009-2013, the top 10 nations are mostly of the European Union, excluding Singapore which is an Asian country ranked top among others. Lately in 2015, Thailand is ranked 67th worldwide or 3rd among ASEAN countries after Singapore and Malaysia respectively; climbing up from 5th position in 2014 [3], [4].

The factors encouraging the increase in the country's competitiveness are the level of prices for mobile services that is affordable, the remarkable increasing trend of mobile phone penetration rates, and the more widespread use of social media. Besides, it is found that the rate of Thailand's Internet connection speeds has increased due to the transformation of mobile phone networks into 3G networks, considered the second fastest 3G network among ASEAN countries after Singapore. This can guarantee that Thailand's ICT performance is not inferior to any other nations in the world.

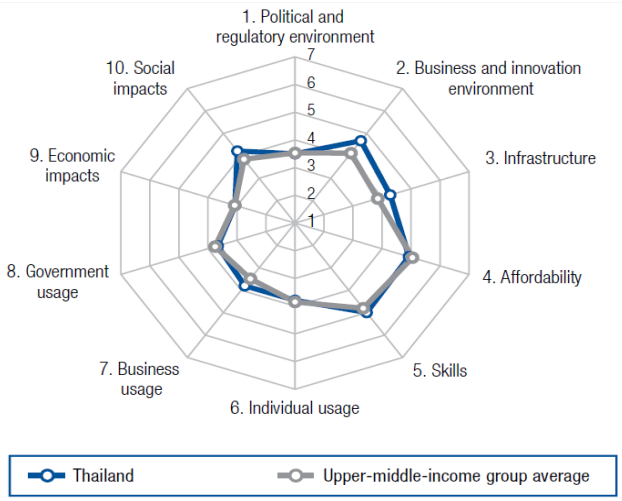

Fig. 1. Thailand's ICT readiness compared with the upper-middle-income-group average [3].

C. IMD's Rankings

The World Competitiveness Yearbook Report compiled by the International Institute for Management Development (IMD) during 2013-2014 has ranked competitiveness of various countries. The ranking results regarding global competitiveness are subjected to more than 300 criteria based on statistical indicators and opinions surveyed from 4,300 executives worldwide. This report has been made public since 1989 and is accepted on behalf of the first-class report on global competitiveness rankings.

TABLE II: ASEAN NETWORK READINESS INDEX 2014-2015 [3]-[4]

Position in the regional ranking	Countries	Position in the world ranking (Out of 148)	Value/7
1	Singapore	2	5.97
2	Malaysia	30	4.83
3	Brunei	45	4.34
4	Indonesia	64	4.04
5	Thailand	67	4.01
6	Philippines	78	3.89
7	Vietnam	84	3.84
8	Cambodia	108	3.36
9	Lao PDR	109	3.34
10	Myanmar	146	2.35

Countries	Position in the world ranking (Out of 143)	Value/7
Singapore	1	6.0
Malaysia	32	4.9
Thailand	67	4.0
Philippines	76	4.0
Indonesia	79	3.9
Vietnam	85	3.9
Lao PDR	97	3.6
Cambodia	110	3.3
Myanmar	139	2.5
Burnei	Out of data	Out of data

Regarding the rankings, IMD normally assesses the potential of various countries in the aspects of development, attractiveness, and the ability to preserve highly skilled workers for domestic firms based on the 3 qualifications as follows:

1) Investments to develop skilled workers in the country reflect the investments in workers' education.
2) Attractiveness reflects the capability of the state to retain skilled workers in the country as well as attract foreign skilled workers to the country.
3) Readiness reflects the country's performance in recruiting skilled workers to meet the market requirements.

Generally, the top countries of the rankings meet the 3 qualifications in balanced quantities. However, Thailand was ranked 29th out of 60 countries in 2014 by IMD (falling 2 positions). The infrastructure is considered Thailand's major weakness because its readiness for scientific infrastructures is slightly poor and falls 6 places from 40th to 46th positions in 2014 (the first time in over 6 years to be lower than 40th position), whereas its level of readiness for technological readiness is quite low although the climb up in the 2013-position for 6 places has taken place, since Thailand has much relied on importing technologies.

From the table, we can see that Thailand' status of economic competitiveness is in the middle income tier. During the past 10 years, the position of Thailand's competitiveness is steady. The Doing Business Report (EoDB) launched by World Bank ranked Thailand 26th in the

level of ease or difficulty in doing businesses out of 189 countries in 2015, considerably 3rd among ASEAN countries after Singapore (1st rank) and Malaysia (18th rank). In addition, the Global Competitiveness Report 2014-2015 (GCI) launched by World Economic Forum (WEF) also ranked Thailand 31st out of 144 countries in 2013, higher than last year's 37th position (climbed up 6 places) [4]-[6].

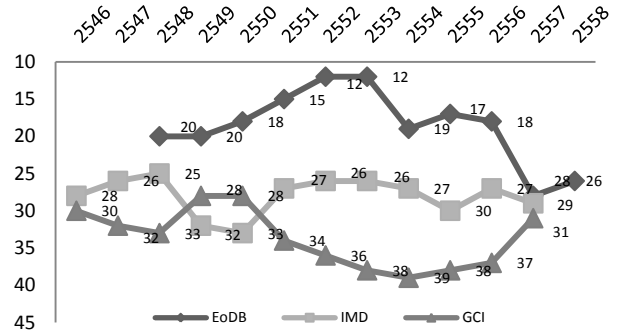

Fig. 2. Competitiveness and the ease or difficulty of doing businesses during 2003-2015 [5].

Global Competitiveness Report 2014-2015 revealing the information about global economy and competitiveness was created by World Economic Forum (WEF) to assess the competitiveness through 12 indices. Out of 144 countries worldwide, the obtained conclusion is interested in 3 aspects as follows:

1) During 3-4 years after the 2008 financial crisis, the major economies such as USA, European countries, and some emerging markets face the decline in productivity growth or the growth rate of products and services manufacturing. That is, the products or services can be multiplied, but in the decreasing rate. WEF views that it mainly stems from the problem-oriented structures of countries that are so complex that the countries with large economies prone to solve the problem through other methods instead of deconstructing their own systems, abruptly followed by adopting short-term economic stimulus incentives in the forms of monetary and fiscal policies to promote market liquidity.
2) Due to single-side solutions to problems concerning the market or financial system, the IMF has lower the estimation of another value; the potential growth or production capacity of those countries. The analysis results show that the overall global GDP will face more sluggish growth.
3) The optimal methods to be free from a cycle of low interests, substantial debts, and high unemployment rates introduced by the WEF are the structural adjustment and the improvement of long-term competitiveness which can well indicate the growth condition of a country. Therefore, the country's competitiveness will perfectly bring about long-term prosperity.

From the maximum perfect Competitiveness Index score of 7, Thailand achieves the score of 4.7, averaged under 12 topics. The advantages of Thailand over other nations are the basic requirements in terms of economic prospects in this particular region which are still very excellent (external factor) and penetration of essential health care and fundamental education (internal factor).

From the graph, it can be deduced that Thailand has the competitiveness benefits over other nations in the Asia region and emerging markets. On the contrary, Thailand's below-mean aspect is innovation. Therefore, in order to compete better in the world markets, Thailand should bring out its own capability and potential first. Comparing Thailand's positions to those of other nations in the Asia region, it is placed 10th in Asia and 31st in the world.

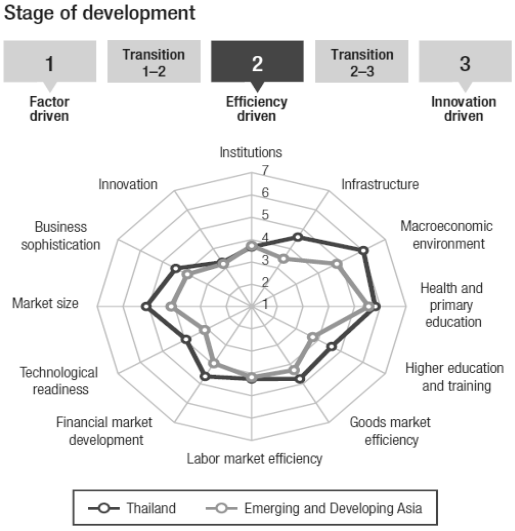

Fig. 3. Thailand's competitiveness [7]-[8].

TABLE III: THE GLOBAL COMPETITIVENESS INDEX 2014 – 2015 OF TOP 10 ASIA-PACIFIC COUNTRIES [7]-[8]

Country	Global Rank
Singapore	2
Japan	6
Hong Kong SAR	7
Taiwan	14
New Zealand	17
Malaysia	20
Australia	22
South Korea	26
China	28
Thailand	31

II. ANALYZING RELATIONSHIPS BETWEEN TELECOMMUNICATIONS INDUSTRY GROWTH AND SOCIAL AND ECONOMIC GROWTH

The study of the National Economic and Social Development Board of Thailand (NESDB) and Division of Telecommunication Economics Research and Information Center, Academy of Telecommunications Resource Management, Office of the National Broadcasting and Telecommunications Commission (NBTC) is conducted to research and find relationships between the proportion of mobile phone penetration rates and broadband penetration rates per the populations that influences the business growth (Real GDP). According to this, the Granager Causality Test is adopted to consider whether the penetration rates contribute to the change in GDP or the GDP affects the change in penetration rates from the GDP data and penetration rates of Thailand mobile phone and broadband Internet services as illustrated by the diagrams below [9].

From the study results, it can be concluded that the penetration rates of mobile phone and broadband Internet contribute to the change in GDP. Conversely, any changes in GDP have no effect on penetrations rates. Therefore, the

continuously increasing rates of mobile phone and broadband Internet will influence the country's overall economic growth and the value of services is forecasted to continuously increase due to data services or the development to lift up the quality of mobile communication systems.

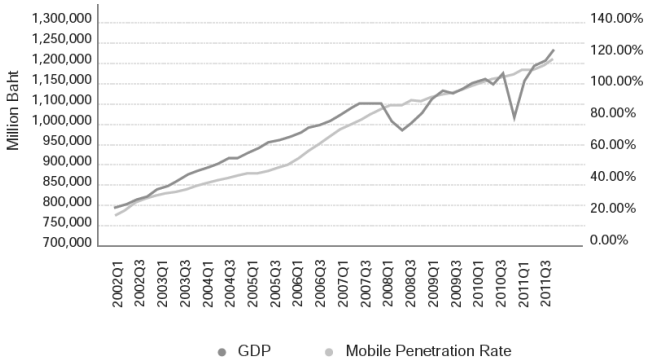

Fig. 4. Relationships between GDP and mobile penetration rates [9].

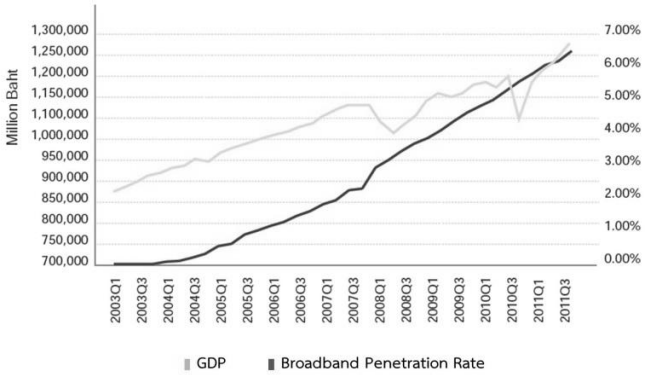

Fig. 5. Relationships between GDP and mobile penetration rates [9].

III. Significance of Regulating Telecommunications

Nowadays, it is globally accepted that communication, interpersonal communication, intergroup communication, including connection between "objects" and access to various types of data play a pivotal role in solving the social problems we are facing. However, when the stakeholders in all sectors are involved in this case, regulations and suitable regulatory agencies are required to keep all control measures in good working order.

The digital transformation of the country's economy is considered the revolution resulted from the open policy and the market liberalization since the late 20th century, including technological breakthroughs, the transformation from the old monopoly system of telecommunications to the new environment subjecting to competition. This gives rise to the imposition of strict rules and regulatory approaches, so that the newcomers can significantly compete with incumbent shareholders in the market. To introduce regulation in the continuously developing telecommunications industry is not an easy task to fulfill because of the digital ecosystem arising from the integration between the information technology, telecommunications technology, media industry, and entertainment industry that have grown without a clear direction. The telecommunications regulation has currently become challenging due to the problems reflecting the rise in numbers and scopes of providing services on digital networks as well as social expectations and needs for professional regulation.

In the continually expending digital ecosystem, the regulatory sectors should come up with some methods to deal with various tasks such as the methods for controlling private, business, and "object" matters as well as the new form of regulation on the basis of offering directions and cooperation, and being a player in a complex partnership.

Therefore, the regulatory sectors should implement some methods toward the efficiency in controlling balance, fairness, and cost reduction in preparing the Digital Cloud Ecosystem on readiness. Moreover, the regulatory sector should adopt the methods to control and promote the establishment of motives for regulation apart from competitive strategies, for example, to efficiently allocate spectrum for mobile phone operators offering IMT, 3G, and LTE services. Finally, the cooperation among regulatory sectors of each country should be enlisted as well.

A. The Changing Telecommunications Market Conditions

General agreements of The World Trade Organization (WTO) indicated that the international community during 1977 mainly yearned for monopolistic market environment. Based on these strategies, the telecommunications sectors promote competition; both in traditional goods and services transactions and electronic goods and services transactions [10].

Since the telecommunications industry keeps changing continuously, it undoubtedly influences the global economy. Although there is an economic depression or global economic crisis, the development in ICT technologies is still cannot be disrupted. This can be seen form the continually rising number of mobile phone subscribers and the increase in the amount of data on the mobile network which has been leapfrogged.

This is especially found in the wireless network market where the use of mobile phones in most industrial countries nearly reaches the saturation point. In other words, the wireless network will gain continual success in developing countries and still has potential to grow, in the developing countries with imperfectly competitive markets.

B. The Transition of Regulatory Approach in Thailand

The telecommunications liberalization in Thailand is slightly different from those in other countries and the transition is usually in three primary phases:

First phase: It is the phase where the state claims to have a monopoly on telecommunications held by TOT and CAT. During this state, Thailand had to face huge challenges and was considered the country with the world's most complex market environment, where the infrastructure-rental concession and state's direct interference in the financial market exist. However, in 1900, various countries worldwide began to liberalize their telecommunications markets, whereas Thailand applied the Build-Transfer-Operate (BTO) regime or the concession contract operated through the two monopolized state-owned enterprises: TOT and CAT. Owing to the contracts' variety in time of occurrence as well as rules and conditions, some operators had greater advantages over their competitors.

Second phase: Based on the WTO's agreements and bilateral trade agreements made with USA, the system of concession contract had to be transformed to the licensing

system in 2006 [10]. This marks the emergence of the second phase where Thailand enforced some laws to differentiate between regulators and operators. Regarding to this, the National Telecommunications Regulatory Authority's laws were implemented in the mid-2005 when merely the businesses in fixed lines and the Internet were liberalized and telecommunications licenses were issued for new entrants, whereas the concessionaires and state-owned enterprises were considered in equality.

Third phase: This phase started a few years after revision of the laws to include broadcasting services. This resulted in the transform of the Office of National Telecommunications Commission (NTC) to the National Broadcasting and Telecommunications Commission (NBTC). The first allocation of spectrum in the 2.1 GHz on October 16, 2012 was considered the first step toward this phase. Therefore, Thailand's next spectrum allocation will be considered the significant step in relocating the spectrum of which concessions expire into the license system [11].

C. Competition in Telecommunications Markets

The competition policies and economic regulations depend on the hypothesis suggesting that public interests can only arise when the market works efficiently. This can commonly happen in the environment with competitive markets; the most efficient and fairest mechanism for manipulation, operation, and economic regulations.

The competitive markets enable operators to make use of the resources efficiently and fairly with the absence of authorized regulatory sectors. The competition will provide the society with highest benefits because of the following supporting reasons:

1) It ensures that the resources, products, and services are allocated to individuals or groups of individuals that most realize the value of such resources, products, and services (efficiency in allocation)
2) It forces market participants to use the scarce resources as effectively as possible (efficiency in utilization).
3) It encourages market participants to introduce innovation and make investments in new technologies at the proper time (efficiency in technological development)

D. Regulatory Methods

Generally, there are 2 regulatory methods: ex-ante regulation and ex-post regulation.

1) Ex-ante regulation is the method by which the guidelines are drawn up in advance, or it can also be called the preventive regulatory guidelines, to prevent the occurrence of unfavorable actions toward the society as a whole, for example, interconnection enforcement, resale enforcement, collocation enforcement, and so on.
2) Ex-post regulation is the method that allows service providers, themselves, make negotiations among each other. It the negotiations fail, the interference from the regulators to handle the disputes caused or the approach in relation to competition laws will be applied. This can be known as the restorative regulation that fixes the consequences of monopoly or unfair competition through identifying the forbidding behaviors that can give rise to the monopolization, reduction, and restriction in competition or unfair competition [12].

During the past few years, the ex-post regulation is considered widespread, especially among countries outside North America. The aforementioned guidelines are subjected to the belief that the regulation should be minimally called for under the condition of high competitive markets, for example, agreements on network connectivity because some issues on agreements of network operators will be complex. If the regulators interfere in some aspects that are inappropriate for the real market conditions, the operators may have to assume higher costs. A large number of regulators and telecommunications specialists, therefore, promote the telecommunications industry sectors to make agreements on connectivity among each other. If the negotiations are not accomplished, the regulators will manage to solve disputes. However, the advantages of preparing the regulatory guidelines in advance or having specific regulatory strategies will promote the negotiations to become easily successful.

Most of the regulatory methods are ex-post based where the competition is subjected to the market mechanism so as to minimize the chance of interference by regulatory sectors, whereas the ex-ante method will be applied merely to specialized telecommunications matters, for example, interconnection of telecommunications networks, roaming, virtual network services. These will promote the competition to provide mobile phone services among new operators as well as the regulation and the merge and acquisition that may sorely influence competitive conditions in markets.

IV. Conclusion

Thailand's telecommunications markets are oligopolistic and have imperfect competition. It is impossible to analyze the factors affecting the development in Thailand's telecommunications industry by specifically relying on any single aspect. Conversely, other related aspects such as the adequacy of spectrum, concession system, and rivalry among current competitors should be taken into consideration as well.

Adequacy of spectrum is considered the most vital aspect that the current and future mobile network service providers worldwide should take into account. That is to say, such network providers demand to use the spectrum to provide high-speed data services, especially the current desires for using high-speed wireless Internet through 3G and 4G. This can be compared to the construction of roads where concrete is the major material the government has to order. If the concrete is deficient, the traffic will become increasingly congested affecting the travelling to be delayed, poor in qualities and also pose a threat to the overall society and economy. Imagine the overcrowded Bangkok without roads, bridges, and superhighways; which have just constructed around 5-10 years ago, due to the lack of concrete.

Telecommunications service providers in Thailand have to face the problems in terms of lacking spectrum to provide high-speed mobile Internet and the uncertainty about whether the spectrum is still adequate in the future, in case mobile phone service providers lack spectrum but have to provide high-speed data services to support the demands of customers. Owing to the problem of spectrum shortage, the service providers formerly spare some spectrum in the 2G system such as the 900 MHz spectrum for providing 3G services,

resulting in the degradation of voice services in the 2G system. Besides, the service providers have to multiply a great number of their base stations and signal posts to support the demands for voice and data utilization with the decreasing bandwidth. These affect the consumers to pay a higher amount for the services that tend to be lower in quality.

Not only does the addition of 2.1 GHz spectrum facilitate operators to provide effective 3G and 4G services, it also raises the possibility that the executives will improve their own telecommunications networks to be more effective so as to support the services of mobile networks: 2G, 3G, and 4G on all of the spectrum bands in their possession. This will enable the operators to provide customers with higher efficient services in terms of voice quality and greater speeds of data transmission.

The concession system is another factor taken into the consideration about necessity in allocating spectrum in the 2.1 GHz band so as to make available the high-speed Internet with affordable prices. The reason behind the allocation of the2.1 GHz spectrum is that Thailand has very high regulatory costs in the concession system compared with other markets in the same level. This affects Thailand's operators to make extremely high revenue sharing payments compared with those in other countries of the same region, whereas the spectrum in the 2.1 GHz band licensed under the NBTC' system brings about reasonable regulatory costs which will have consequences for consumers. Without the licensing system, the operators have to provide 3G and 4G services under the old concession system using the old spectrum. This will make the prices of services to be 5 times higher than those operated under the licensing system, due to the higher regulatory costs.

Competition and development in telecommunications industries are among the final factors used in analyzing the results of 2.1 GHz spectrum auctions along with the investments valued many ten billion baht on telecommunications network during many years ago. Therefore, the possibility for having new entrants into the industry is considered very faint due to several reasons such as uncertainty about regulation, the licensing system, and the legislative conflicts which have widely expanded and frequently occured during the past 5 years. This includes the matter of investment funds in new infrastructures to compete with the incumbent operators.

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