ICT PENETRATION IN INDONESIA: CURRENT STATUS, OPPORTUNITIES AND CHALLENGES

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ABSTRACT

Indonesia is known as a country covering such vast area, with such high number and diversity of its population; ICT thus can be used as an alternative to integrate this vast region and its people. This study aims at finding out the development and determining the position of Indonesia in the global environment in terms of the development and application of ICT based on Networked Readiness Index (NRI). NRI indicates the extent to which developed and developing countries around the world use ICT to improve their competitiveness. The measurement uses 54 indicators grouped into 10 pillars, namely political and regulatory aspect, innovation and business sector, infrastructure and digital content, affordability, skills, individual use, business use, government use, economic impact, and social impact. Indonesian network readiness index rating increased from position 80 in 2012 to 76 in 2013 out of 144 countries included in NRI. Indonesia shows improvement in regulatory aspect and economic impact of ICT. One of the main challenges is the digital divide between among regions and among communities, especially in the levels of ICT usage by individuals and households which shows decline in the rank based on NRI. The condition and position of Indonesia require some efforts to increase ICT penetration and ICT impact on the economy and social aspects of the country.

Keyword: Networked Readiness Index, Digital Divide, ICT Density

1. INTRODUCTION

Indonesia is an archipelago with a total area of 1,904,556 km^2, consisting of 17,504 islands, 9,634 of which have not been named. Referring to the data from the Ministry

Home Affairs in 2013, Indonesia consists of 33 provinces, 399 Regencies, 98 Municipalities, 6994 Sub-Districts, 8309 urban-villages, and 72944 villages [15]. The population of Indonesia is number four of the world highest population number, now approaching 250 million people. Demographic and geographic data becomes the potential and challenges in the era of globalization and information. The challenge faced by Indonesia is how ICT can connect or integrate the country and its people. Unfortunately, Indonesia has not yet optimized this type of technology, which can be seen from several indicators, including the ICT density, or the level of ownership or use of ICT facilities by the people of Indonesia, including its impact on social and economy of the country.

The impact of ICT on economic performance becomes an interesting issue. Various studies indicate that developed countries (as measured by income per capita) do not necessarily have greater benefit than less developed countries in the development of ICT. Irawan [19] stated that the difference on the impact of ICT on one country depends on the intensity of ICT use and the structure of ICT sector. According to Cortes and Navarro [3], countries in the world have achieved varying levels of economic development, productivity, and human resource development based on different levels of ICT implementation. Campisi *et al.* [1] state each country should examine carefully the use of ICT by businesses and households as to ensure access to ICT. To do this right effectively and efficiently, government should make appropriate policies and programs to assist the strengthening and expansion of ICT infrastructure in orde to allow widespread diffusion of ICT, which in turn will improve its technical efficiency.

ICT penetration in Indonesia is still left behind compared to developed countries if we refer to the networked readiness index released by the World Economic Forum. This lag in terms of ICT indicators can affect the position of competitiveness and economic growth of Indonesia. This is consistent with the statement by Kubielas and Skorek [18] that the readiness of networks is a very important component determining competitiveness. According to Camagni and Capello [17], ICT can affect competitive advantages not only sectorial but also overall economic competitiveness. This article describes the development of ICT penetration in Indonesia referring to the data available in the International Telecommunication Union and the Global Information Technology Report. Various constraints faced by Indonesia, as well as future opportunities and challenges, are presented, including some aspects of regulations that have been issued by the government of Indonesia.

2. THEORETICAL FRAMEWORK

OECD (Organization for Economic and Cooperation Development) defines Information and Communication Technology, hereinafter referred to as ICT, as a series of activities facilitated by electronic equipment which includes processing, transmission, and presentation of information. ICT is a convergence of three areas, namely information technology, data and information, as well as socioeconomic issues. One of the keys of that transformation is ICT. According to Cortés and Navarro [3], the rapid development of ICT and how technology is eventually used by households, businesses and governments at the local, regional, national, and international scale has caused real revolution. Kivunike, Ekenberg, and Danielson [5] stated that some indicators related to ICT are very precise in evaluating the

contribution of ICT to economic and social development, especially in developing countries.

According to Kivunike *et al.* [5], the evaluation criteria for ICT development consist of three levels, namely dimension, impact, and outcomes, as well as a number of indicators for the impact and outcomes. Development is defined as a multidimensional concept that is based on the capability approach of Sen (Amartya Sen), which mainly focuses on outcomes (opportunities) and benefits. The model of evaluation criteria for ICT development can be seen in the figure 1.

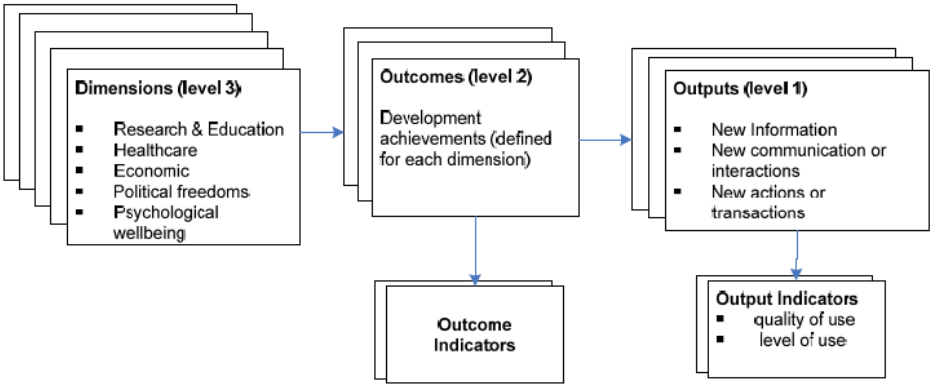
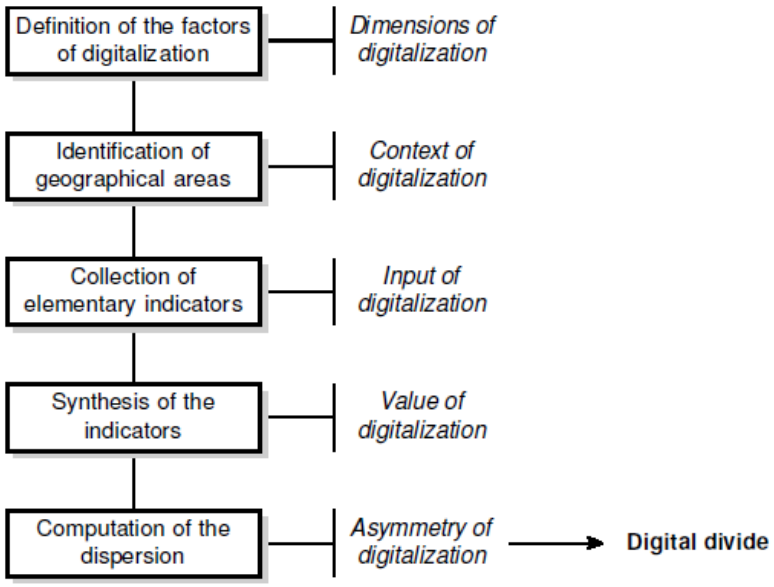


Figure 1. Evaluation criteria for ICT development [5]

Differences or gaps in the use of ICT is known as the digital divide. Many researchers have begun to examine digital divide, and suspect that this can affect aspects of life, including the progress or growth of the economy of a country. Corrocher and Ordanini [16] describe the logical steps for the development of devices to measure digital divide in the figure 2.



Figue 2. The Measurement of Digital Divide [16]

Corrocher and Ordanini [16] measure digital divide in the context of inter-country comparison. Digital divide is then associated with the development stages of a country. The impact of digitization—that is the level or intensity of digital technology (ICT) use in a country, whether by individual, corporate, public—forms the S curve that includes three phases over time, i.e. speed, intensity, and impact. The final impact is the social and economic changes experienced by the country. The social and economic impacts of ICT are presented in the form of a conceptual framework of the information society by the International Telecommunication Union (ITU) as presented in the figure 3.

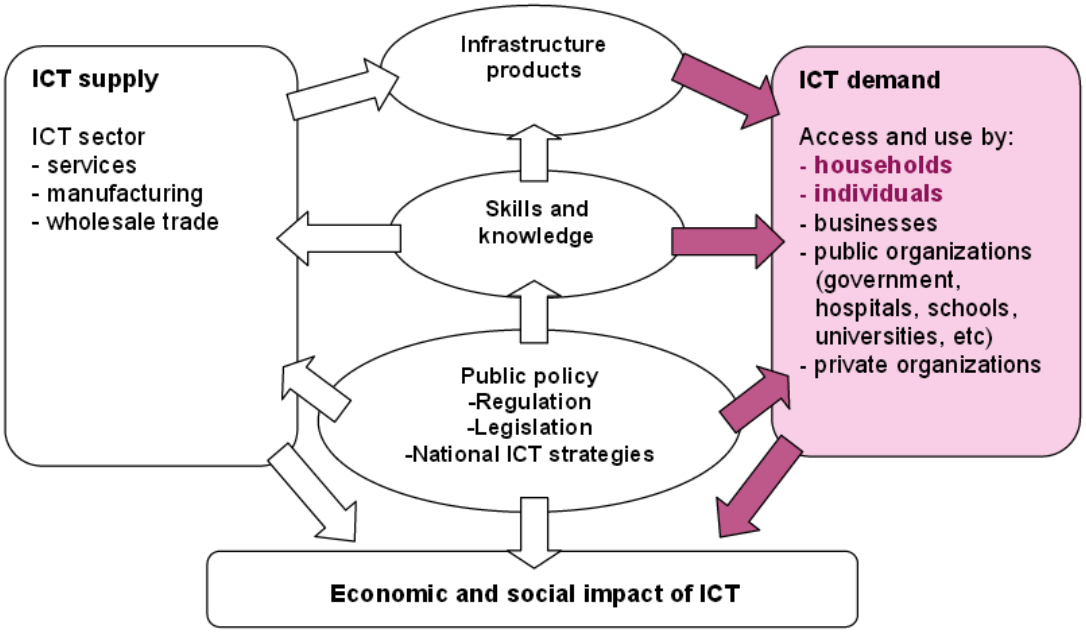


Figure 3. Information society conceptual framework [12]

The curve shows that economic growth of a country is always preceded by investment in ICT infrastructure through the adoption or diffusion process of CT—either by individual, business, or community. Furthermore, when individuals or communities are already ICT literate, all ICT-based business processes can be well developed.

World Economic Forum (WEF) has developed a composite indicator called the Networked Readiness Index (NRI). WEF says that NRI is a measure that indicates the extent to which developed and developing countries around the world use ICT to improve their competitiveness. NRI consists of four sub-indexes, namely (1) ICT environment, (2) the readiness of the community to use ICT, (3) the actual use of ICT by all key stakeholders, and finally (4) the impact of ICT on the economy and society. ICT is considered to be the main driving factor that could have an impact on economic growth and social development in a country.

3. RESEARCH METHOD

Data on ICT indicators and competitiveness is taken from the Global Information Technology Report published by the World Economic Forum in 2013 and 2014. GITR rank 144 countries based on network readiness index measured using 54 indicators grouped into 10 pillars, namely political and regulatory aspect, innovation and business sector, infrastructure and digital content, affordability, skills, individual

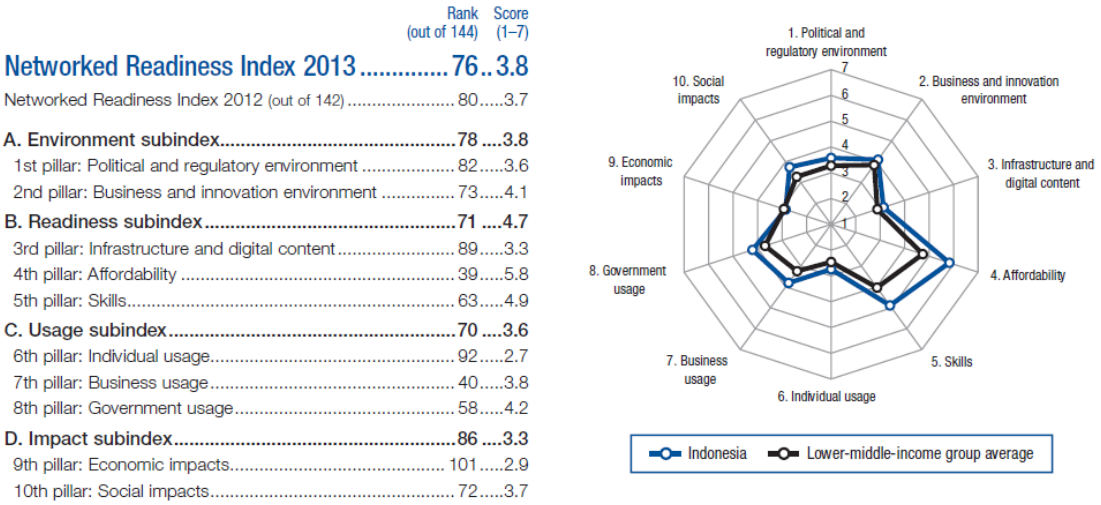
use, business use, government use, economic impact, and social impact. The other data source is ICT density obtained from the International Telecommunication Union and courtiers' profile from the datasheet provided on the website of the World Bank.

This study focuses on qualitative and descriptive analysis on the development of the network readiness index of Indonesia, especially to know the progress and position of Indonesia, both globally and regionally. The discussion focuses an analysis of development for each dimension and indicator which in the Networked Readiness Index that can be used to identify the issues or challenges faced by Indonesia. Various attempts made by Indonesian complement the discussion, including the regulatory aspects of the use of ICT in Indonesia.

4. DISCUSSION

4.1. Networked Readines Index 2013 and 2014

Indonesian networked readiness index rating increased from position 80 in 2012 to 76 in 2013. Affordability is a pillar of the highest rank, compared to the other 7 pillars, which rank 39 in the world, while the worst is the pillar of the economic impact (of ICT) which occupies position 101 in the world. These conditions indicate that Indonesia is on the stage of development and implementation of ICT through the commencement of various suitable efforts, but ICT has not brought a significant impact toward the economy of the country. The impact of ICT on the social aspect is still relatively low, which ranks 72. The use of ICT has increased significantly which improved at least 15 ranks so it is now occupying position 76 in the world. This improvement is encouraged by the use of ICT by businesses sector, which ranks 40. General illustration on the networked readiness index for Indonesia in 2013 can be seen in the figure 4.



	Rank (out of 144)	Score (1–7)
Networked Readiness Index 2013	**76**	**3.8**
Networked Readiness Index 2012 (out of 142)	80	3.7
A. Environment subindex	**78**	**3.8**
1st pillar: Political and regulatory environment	82	3.6
2nd pillar: Business and innovation environment	73	4.1
B. Readiness subindex	**71**	**4.7**
3rd pillar: Infrastructure and digital content	89	3.3
4th pillar: Affordability	39	5.8
5th pillar: Skills	63	4.9
C. Usage subindex	**70**	**3.6**
6th pillar: Individual usage	92	2.7
7th pillar: Business usage	40	3.8
8th pillar: Government usage	58	4.2
D. Impact subindex	**86**	**3.3**
9th pillar: Economic impacts	101	2.9
10th pillar: Social impacts	72	3.7

Figure 4. Indonesian networked readiness index rating in 2013 [21]

In 2014, Indonesian NRI rating increases to 64 from 148 countries. General illustration on the networked readiness index for Indonesia in 2014 can be seen in the figure 5.

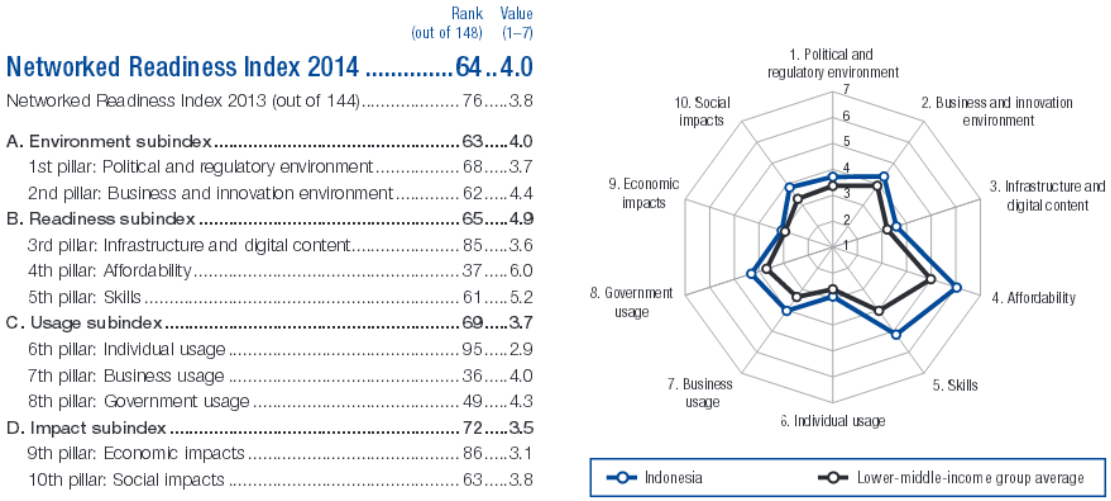


Figure 5. Indonesian networked readiness index rating in 2014 [22]

All the pillars show an increase, except for individual usage pillar. The pillar with the highest increase is economic impact pillar which jumps 15 levels, and political and regulatory environment pillar which jumps 14 levels. General illustration on the improvement of networked readiness index for Indonesia can be seen in the table 1.

Table 1. Improvement of Indonesian Networked Readiness Index 2013-2014

	Sub index and pillar	World Rank		
		2013	**2014**	**+/-**
A.	**Environment subindex**	78	63	+15
	1st pillar: Political and regulatory environment	82	68	+14
	2nd pillar: Business and innovation environment	73	62	+11
B.	**Readiness subindex**	71	65	+6
	3rd pillar: Infrastructure and digital content	89	85	+4
	4th pillar: Affordability	39	37	+2
	5th pillar: Skills	63	61	+2
C	**Usage subindex**	70	69	+1
	6th pillar: Individual usage	**92**	**95**	**-3**
	7th pillar: Business usage	40	36	+4
	8th pillar: Government usage	58	49	+9
D.	**Impact subindex**	86	72	+14
	9th pillar: Economic impacts	101	86	+15
	10th pillar: Social impacts	72	63	+9

Based on the increase in the NRI ratings, Indonesia is showing an increase in the development and application of ICT, especially in policies and regulations as well as the impact of ICT on the economy of the country. It should be the concern of government and other stakeholders related to the decrease on the use of ICT by individuals. This pillar is measured using seven indicators, namely mobile phone subscriptions, individuals using the internet, households with personal computers,

household with internet access, fixed broadband internet subscriptions, mobile broadband subscriptions, and the use of virtual social networks.

4.2. The Development of ICT Indicators

Indonesian NRI rankings tend to increase from year to year which can be seen through the more affordable price of internet access and mobile phones, as seen from affordability pillars which becomes the best pillar for Indonesia. From the point of view of ICT development stage, according to the World Economic Forum, Indonesia is in phase 2 or efficiency-driven phasing, altogether with 30 other countries. The new stage shows Indonesia merely uses ICT for efficiency, and has not put it as the driving factor of innovation, that is stage 3, as in developed countries. The main obstacle in the use of ICT is decrease in the level of usage by individuals. It may be associated with the very large number of people in Indonesia, and the prevalence rate of ICT penetration by individuals and households. Such data proves that digital divide still exists in Indonesia. Four indicators rank lower than 100 other countries, namely fixed broadband subscriptions (at 1.2 per 100 people, ranking 103), percentage of household with personal computers (15.1%, ranking 103), percentage of individuals using the Internet (15.4 %, ranking 112), and the percentage of household with internet access (6.5%, ranking 117) , The development of ICT indicators for ICT use in Indonesia during the period of 2000 to 2013 based on data from the World Bank [20] can be seen in the figure 6.

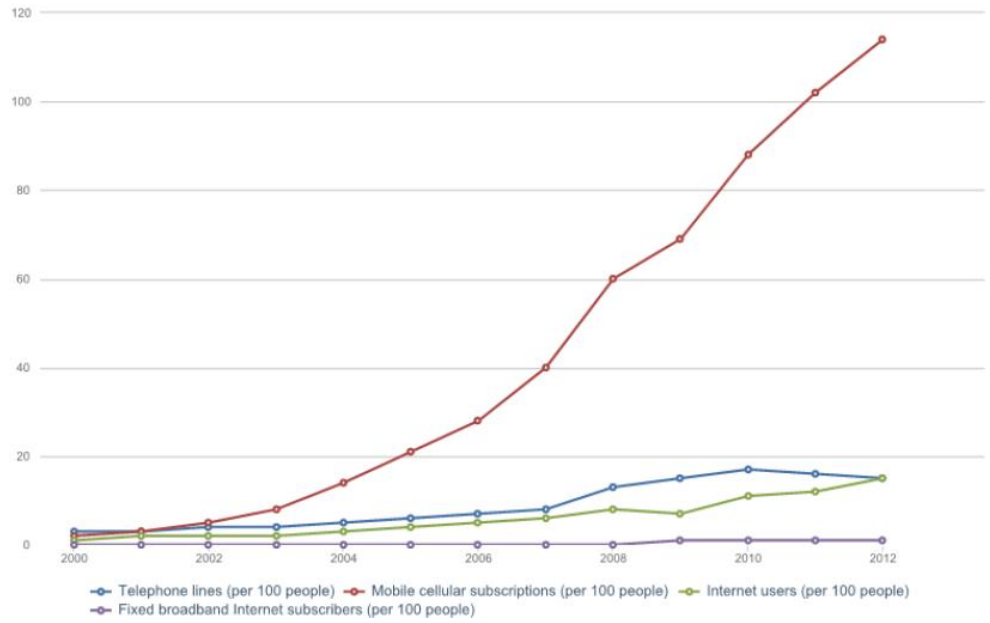


Figure 6. The Development of ICT Indicators in Indonesia (Data source: Wordbank)

Networked readiness ranking index can be used as a basis for formulating policies or actions that can encourage a more productive ICT penetration, thus giving significant impact on the social and economic transformation in accordance with the national identity. ICT indicators used as the basis for calculating networked readiness index can be used as key performance indicators of various stakeholders, especially the government, particularly the Ministry of Information and Communications. The development of ICT indicators which refer to the International Telecommunication

Union is also monitored by the Ministry of Communications and Information periodically. Examples of some profiles on the use of ICT are provided in the table 2.

Table 2. The ICT Profile of Indonesia in the Period of 2011 to 2012

ICT Indicators	Unit	2011	2012
Selular	Subscription	249.805.619	281.963.665
Fixed Wireless Access	Subscription	29.966.764	30.315.671
Public Switched Telephone Network	Subscription	8.650.716	7.667.184
Internet	Subscription	55.000.000	63.000.000
Internet Service Provide	Subscription	-	1.032.316
Internet Penetration	Percentage	22,8%	25,01%
Selular Penetration	Percentage	103,65%	111,95%

Source: ICT Whitepaper [14]

4.3. Challenges and Obstacles

The conditions and position of Indonesian require some effort to improve the penetration and the impact of ICT on the economy of the country. Indonesia still faces digital divide, especially infrastructure gap between Java Island and areas outside Java Island, as well as ICT access gap between urban and rural areas, or among classes in the society. Increased human resources and ICT infrastructure must become a top priority so that ICT penetration can provide more significant impact in the future. For the government, the implementation of e-government is a challenge that needs to be prioritized so that services such as bureaucracy-related service, which is still questionable based on the survey results of the World Economic Forum, can be improved through the application of ICT in the public service.

The effort in general starts to increase ICT penetration in various sectors, which was initiated by the government through the Ministry of Information and Communications or ICT activists, especially for education institutions. Indonesian government through the Ministry of Information and Communications has developed more detailed ICT indicators tailored to the needs and conditions of the country. According to the Ministry of Information and Communications, an indicator is defined as a way to deliver information based on the size or statistical data, which describes information on a particular or important issue [13]. For developing countries such as Indonesia, developing indicators that can describe the current conditions of the country is an important part of ICT as a tool for policy analysis and planning.

One of the major constraints in Indonesia is to provide equal infrastructure of in every region of Indonesia. According to the Ministry of Communications and Information, the challenge of a country like Indonesia is on the provision of infrastructure to support economic activity. Infrastructure itself has a very broad spectrum. One thing that should get primary concern is the infrastructure that encourages connectivity between regions so as to accelerate and expand the economic development of Indonesia. The provision of infrastructure that encourages connectivity among regions will reduce transportation and logistics costs, and will improve product competitiveness and accelerate economic movement. Included in this connectivity infrastructure is the development of transportation line, information and

communication technology (ICT), as well as the establishment of all regulations and rules associated with it.

Research on the relationship between ICT and economic development has often been done on various countries or cross-country setting, especially for some regions or group of countries with certain criteria, for example, developed countries compared to developing countries. Kubielas and Skorek [18] mention the readiness of networks is a very important component for competitiveness. Based on data from World Bank [20], the relationship between competitiveness and per capita GDP can be seen in Figure 7.

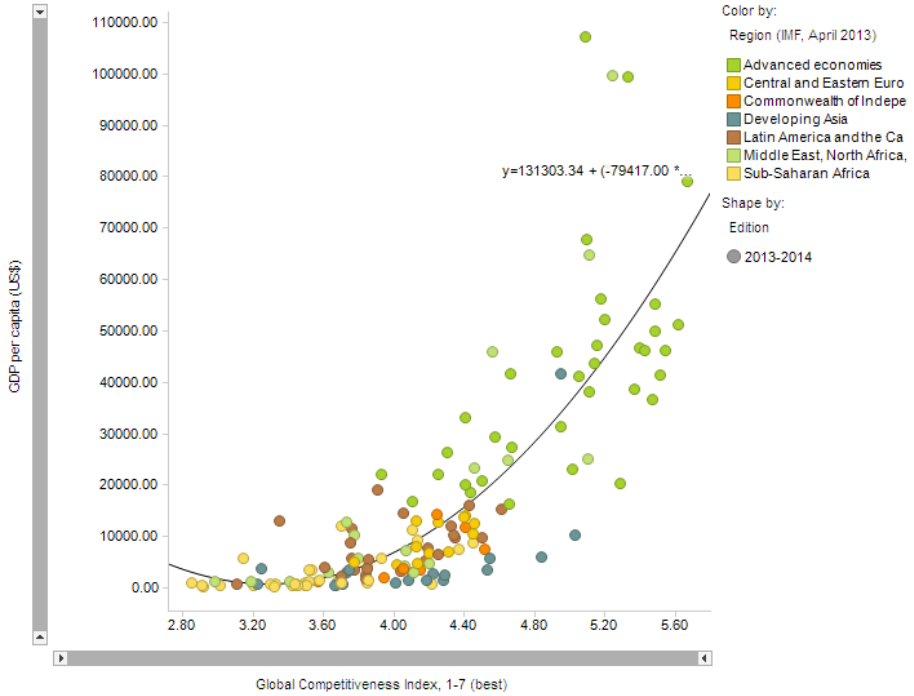


Figure 7. Competitiveness and GDP per capita (data: GITR datasheet)

Indonesia still has technological limit that allows for the exploitation of ICT in accelerating economic growth, while developed countries having reached their technological limit and optimal use of ICT so they need to find more advanced innovation than ICT in general. According to Irawan [19], if the per capita income is used as one measure of the development of a country, the results show that Singapore shows a multiplier effect smaller than Indonesia, Malaysia, and Thailand. Indonesia whose per capita GDP is the lowest shows higher multiplier effect.

One implication from the results of the previous studies research is that ICT is not the only factor that determines economic development, or on other words it must be backed up by a factor of human resources and organization. Feiguine and Solovjova [6] state the development of ICT is not merely an investment of computer equipment or communication network alone, but must be supported by a well-educated and high qualified workforce. Issues on human resource are major challenge to Indonesia, whose ranks in the aspect of education and training in the Global Competitiveness Ranking is relatively low.

4.4. ICT Related Regulations

Martínez and Rodríguez [2] stated that policy makers must now begin to focus on other assets, in addition to ICT, that is education, capital technology, and research and innovation as a key factor to improve economic productivity. The government should also encourage the use of the internet by businesses and support the development of human resources as a strategy to promote export, growth, and development [4]. Indonesia generally shows improvement in the regulatory aspects when referring to the NRI rankings in 2013 and 2014, and the pillar even shows the highest rank. Indonesian government has set up some policies or regulations that encourage the development and application of ICT at the level of individuals, businesses, and government.

Firstly, the establishment of the National ICT Council, an executive coordinating agency established and chaired by the President of the Republic of Indonesia, which was first established through the Presidential Decree Number 20 of 2006 [8]. Periodically, the president establishes the management team and members on the council, which in 2014 was set through the Presidential Decree Number 1 of 2014 on the Board of National Information and Communication Technology [9]. The tasks of the Board are (a) formulating general policies and strategic directions of national development, through the development of information and communication technology, including infrastructure, applications, and content; (b) conducting the assessment, evaluation, and providing input to solve strategic issues arising in the context of the development of information and communication technology; (c) coordinating with the national agency of the Central / Local Government, State-Owned Enterprises / Regional-Owned Enterprises, Business World, Professional Institutes, and the communities in order to develop information and communication technology as well as empowering communities; and (d) approving the implementation of information and communication technology programs across ministries to be effective and efficient.

Secondly, the enforcement of the Act of Information and Electronic Transaction (Indonesian Cyber Law) Number 11 of 2008 on Information and Electronic Transactions. The act forms the legal basis of some cases in Indonesia, especially the issue of defamation through social media. The law is expected to be a legal basis of legal issues that may be encountered when delivering information, communication, and / or transactions electronically, particularly in terms of evidence and case law related to actions on electronic system. Referring to the act, the Government of Indonesia has issued Government Regulation Number 82 Year 2012 on Operating System and Electronic Transactions [7].

Thirdly, the Ministry of Communications and Information Technology has published a book on ICT Indicators of Indonesia in 2011. Various indicators of ICT have become one of the references for the success and performance targets in the government's ICT development program. In 2013, the Ministry has also issued the White Paper on Communication and Information Technology of Indonesia. The book has become a national policy framework for the development of ICT. Broadly speaking, the planning and strategy for Indonesian ICT development is done through both regional and sectorial planning approach.

Finally, the various sectors or ministries must follow the policies and regulations up through the establishment of more specific legislation or regulations, such as Act No. 14 of 2008 on Public Information that regulates the transparency of information in public sector. The Ministry of Education and Culture has published guidelines for distance learning which are completed with the use of ICT in the educational process and has also been implementing a national system of academic information that must be followed by all universities in Indonesia. In the business sector, transparency and disclosure of information have also been implemented, including the disclosure of financial information on the website for banking and insurance. And the last, two examples of the application of ICT regulation for the public sector are (1) the Regulation of the Minister of Communication and Information Number 28/Per/M.Kominfo/9/2006 on the Use of Domain Names go.id for Official Web Site of Central and Regional Government [11] and (2) the Indonesian Government Regulation Number 56 Year 2005 on Regional Financial Information System which has been amended by the Indonesian Government Regulation Number 65 Year 2010 [10].

5. CONCLUSION

ICT indicators in Indonesia tend to increase, but the large population and vast territory have led Indonesia to still face challenges and obstacles in exploiting the potential of ICT for national benefit and growth. One obstacle faced is related to of digital divide, both from the aspect of inter-regional and community groups in the terms of mastery and application of ICT. This can be seen from the decrease in the NRI rating for individual usage pillar based on the Global Information Technology Report in 2013 and 2014. Although infrastructure constraints of and digital divide still exist, various government programs, both sectorial and regional, have shown that ICT indicators associated with infrastructure have improved in recent years, in particular the impact of ICTs on the economy and social aspects. Various policies and regulations that have been set by the government will become one contributing factor in the increase of ICT penetration in Indonesia in the future.

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