

Impact of Icts Development on Economic Growth in Indonesia

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ABSTRACT: *Information and communication technologies (ICTs) have become human needs in the world today, including the Indonesian community that has accepted the use the support their daily activities. Utilization even already meets almost all areas of life such as education, health, business and trading, companies and other non-profit organizations. This paper using endogenous economic growth (EGT) model, the type of quantitative data on to time series from the year 1998 to 2014 in Indonesia. Economic growth model will use the method of linear regression model estimation of ordinary least square method (OLS), as well as software EViews-8. The next study will analyze the mapping between the high and low the growth of ICT to economic growth across the province level throughout Indonersia. This mapping analysis using Klassen typology mapping the inequality of the ICT sector. The results of the model estimation and data running to indicate that gross fixed capital formation (K), the number of Internet users (A), and the number of people in productive age (L) has positive and significant to impact on economic growth in Indonesia. Furthermore, in the ICTs sector mapping inequality among provinces in Indonesia. As for the analyses of mapping between the productive populations level with internet usage among countries proves that Indonesia is in quadrant one grade, where the number of productivity age population is relatively high with high internet users.*

Keywords: *ICTs, Economic Growth, Klassen Typologi*

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I. Introduction

ICT advances marked by the development of various sectors such as the use of an in correspondence now was more efficient by using emails. Not only that, in education, health, banking, business, and communication within the company has also been utilizing ICT use becomes more efficient, time saving and low cost.

The world of education, use of ICT in everyday learning model also had the use of ICT, such as the combination of audio, video, and the internet technology. Capabilities and characteristics of the internet allows in the distance teaching and learning process or E-learning to be more effective and efficient so as to obtain better results. Furthermore, ICT is also used in the distance learning such as conferences both nationally and internationally or teleconference, so that the problem of time and distance can be solved.

In Indonesia, many who utilize ICT in everyday life, which can looked of the number of Internet users has increased every year. Indonesian Internet Service Provider Association released the results of national research related to the number of Internet users in Indonesia in 2014 in cooperation with the Communications Research Centre (Puskakom) University of Indonesia said that, Internet users in Indonesia has reached 88.1 million people, while the growth of internet users increased by 23.74% compared to 2013.

The ICT sector has become a global issue in promoting economic growth in a country. Examples such as the international trade sector, which certainly used the port as a means by which to distribute goods. Ports are still using a manual system becomes very inefficient because of the operational costs and the use of a memorandum in recording. Today at the port already take advantage of the ICT sector by using the online system. Through online services so users can access the port services anywhere and anytime.

Using a communication device in the form of an online service and Internet network, the activities of banking transactions can be done in host to host, a system of cooperation between ports with the banks. These conditions makes the system work more efficiently and effectively in facilitating economic actors made transactions. In addition, the sector of Small and Medium Enterprises (SMEs) in Indonesia also has great potential in the use of ICT, such as the development of e-commerce in the production and trade of goods or services.

Advances in technology closely related to factors that promote economic growth in Todaro (2011), namely human capital. Changes in technology can only be done by a human, so that the progress of technology is not only viewed from the side which is renewable, but can be attributed to education and innovation. Of human capital is a very important factor of the change technology, so as to improve the ability of a human being in innovating one of which uses the educational aspect. In human capital theory states that, if a person

wants to increase his income by level of education, the educational aspects become the determining factor progress of these technologies.

Based on the data onto Gross Domestic Product (GDP) of Indonesia by the Central Statistics Agency (BPS), the GDP growth rate of period 2001-2014 showed relatively lower compared to the growth rate and the ICT sector. Through the description of the background of the problem, describe how the influence of variable technology advances by using the data onto users of ICT to economic growth of Indonesia and how the ICT sector analysis of the imbalance between the provinces in Indonesia at this time.

II. Theory And Literature Review

The theory of endogeneity economic growth arises as the reaction disability of neo-classical theory about of proving the convergent tendency, namely a tendency in which each country would have income percapita levels are relatively similar. Convergence demanding that the industrialized countries will grow more slowly than poor countries. In fact there are four benefits of economic calculation in the context of macroeconomic namely: one; Growth to improve the welfare, two; Growth can increase employment, three; Growth may improve income distribution, and four; Growth can prepare the next stages of economic development. Thus, the effect of technological progress (technological progress) in the form of increased specialization of labor, invention (innovation) of the new goods, the production methods and the role of monopoly powered as an incentive for the development of the technology

Since the mid-1980s, research in economic growth raises the spirit and passion for the development of macro-economic thinking. Starting from Romer (1986) and Lucas (1988) and Ruttan (1998). The motivation of their research was observation to determinants of economic growth in the long run, because it is very important mechanism of the business cycle or counter cyclical effect through on monetary and fiscal policies. Furthermore, the introduction to the significance of long-term economic growth, is the first step in looking at new variables that determine economic growth. Their researches have been exceeded the neo-classical models, where the number of long-run growth paged by a number of progresses technological is considered as exogenous. So the latest contribution to determining for the long-run of economic growth rate is endogenous growth models.

Using the theory of research and development, that assuming competition is not perfectly into the framework of economic growth started by Romer (1987, 1990) in the Ruttan (1998) and also the contribution to Aghion and Howitt (1992) and Grossman and Helpman (1991). Built on the model, the development of technology that will be generated through the activity of the R & D. This activity is accomplished through the power monopoly to accelerate its development. The growth rated and the number of discoveries did not reach Pareto optimal for their distortions with respect to the creation of goods and new production methods

Endogenous growth theory can actually bridge the gap between the theory of various braided empirical historical literature of economic growth. Crafts (1996) and Aghion (1998) has determined that the endogenous growth theory innovation (innovation endogenous growth theory) may help explain why productivity growth is so low in Britain in the early 19th century this theory can also explain the presence of increasing returns to scale the overall production as well as the role of positive externalities in determining the growth rate of capital investment. Production can continue to grow in a way to avoid diminishing returns to scale on the model, in other words, this decline could be reversed by the advancement of technology internally. Romer (2006), diminishing return does not occur to the model for their externalities of research effort that extends for one company to another. So the concept of endogenous growth theory can measure the growth rate of technology internally.

In some empirical studies like Zohra (2012) found that ICT has a positive and significant effect on the growth of developed countries, on the Effects of ICTs on economic growth in a country with panel data to some developed countries and developing countries in the world. International growth imbalances can be explained from the gap between the digital sector among several countries. Furthermore, according Samimi and Ledari (2015) that ICT and economic growth showed a significant positive correlation in both developed and developing countries. Harchauni, Jackson and Armstrong (2002) in ICT and Economic Growth comparison between two country for US and Canada showed that ICTs have a big impact on economic growth, while for capital in Canada is slightly lower than in the United States. Takahiro and Kazuyuki (2012) is almost the same as the Harchauni Cs but for two different countries namely Japan and South Korea found that for both countries, the ICT industry sector is an important source of economic growth and productivity of the supply side effect. In addition, active ICT investments should lead to substantial investments in ICT services actually contribute to the economic growth of the demand side.

III. Methodology

1. Approach Research and Data

This study uses a quantitative approach which aims to analyze and estimate the relationship and influence on variables that have been determined to answer the problem formulation. The data presented is data time series. The variables to be observed are economic growth and the growth of the ICT sector in Indonesia. Variables that also will be analyzed are the number of Internet users and the number of productive human resources.

Quantitative research is the systematic scientific study of the parts and phenomena and relationships. The purpose of quantitative research is to develop and use of mathematical models, theories and hypotheses pertaining to natural phenomena. The measuring process is a central part in quantitative research because it provides the fundamental connection between empirical observation and mathematical expression of quantitative relationships.

2. Set Up Model

Model estimates used to know how to influence the development of the ICT sector to economic growth of Indonesia by using model Endogeneity Growth Model, which begins with the production function CobbDouglas. Base on to Solow models. The function of economic growth can be expressed as follows:

$$Y_t = AK_t^\alpha L_t^\beta$$

Where (Yt) The production level in year t, (At) Advances in technology, (Kt) The amount of capital stock, and (Lt) labor force. Variable technological advances in the production function CobbDouglas considered constant, in theory Solow Growth Model is said that technological advances incorporated as exogenous factors. With the following functions:

$$Y_t = K^\alpha (AL)^{1-\alpha}$$

Because of the above functions are not in a linear shape. While in this study using linear regression analysis techniques smallest square method (OLS), the function must be on linearity by natural logarithm (Ln). As a result of the natural logarithm function are as follows:

$$\ln Y_t = \alpha \ln K + (1-\alpha)[\ln A + \ln L]^{1-\alpha}$$

Then the econometric model that will be used in this study are as follows:

$$\ln Y_t = \beta_0 + \beta_1 K_t + \beta_2 A_t + \beta_3 L_t + \varepsilon_t$$

where Yt, is the economic growth rate in year t, Kt is gross domestic fixed capital formation, At is the number of internet users, and Lt, the population of productive age.

3. Economic inequality of ICT

To analyze the inequality in the ICT sector between provinces throughout Indonesia in this study using Klassen typology analysis . Klassen typology analysis used to map the economic mapping with the development of the ICT sector between the provinces in Indonesia . This mapped will be in classification into 4 quadrants analysis . Classification Klassen typology can be described on Typology Klassen will map the provinces based on two main indicators, namely: Economic Growth with ICT Growth; Through this method, there are four characteristics of the economic growth pattern and structure of different.

Table 3.3
Typology Province Based Economic Growth and ICT Growth Rate

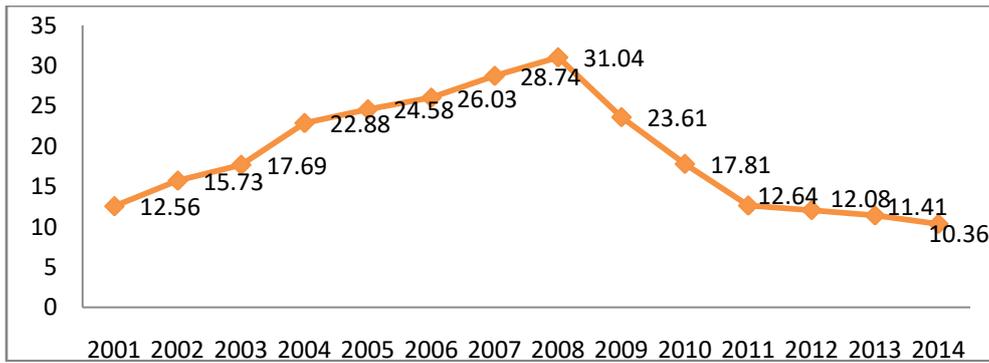
ICT Growth (Y)	(Yi < Y)	(Yi > Y)
Economic Growth (r)	<p>(Quadrant II) <i>growing region</i> ICT growth is high but low economic growth</p>	<p>(Quadrant I) <i>Rapid growth region</i> High ICT growth and High economic growth</p>
(EGi > EG)	<p>(Quadrant III) <i>Relatively backward region</i> ICT growth is low and low economic growth</p>	<p>(Quadrant IV) <i>Retared region</i> ICT growth is low but High economic growth</p>
(EGi < EG)		

IV. Result And Discussion

1. Data Description

Patterns of Development ICT in Indonesia

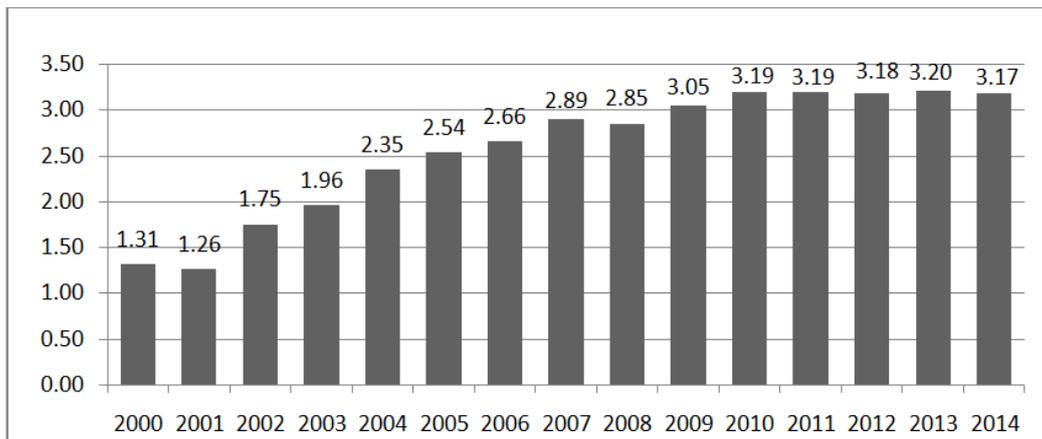
Transportation and communication sector, especially sub-sector communication between the structure of the Gross Domestic Product Indonesia is one sector that has great potential to be developed. Based data onto from the Central Bureau of Statistics the rate of growth of the communications sector had many interesting trends can be seen in this following figure 4-1 :



Source : Indonesia Central Berau of Statistic (many years)

Figure 4.1 ICT Growth Rate Periode 2001 - 2014

In 2008 the growth of the ICT sector experienced considerable growth as high as 31.04%. But after 2008 experienced a low growth rate. During the 14-year average growth rate of ICT Indonesia experienced a 19.083%, where growth of 2014 is below 2001. But in terms of the contribution to ICT to the GDP of Indonesia from 2001 to 2014 have the tendency towards increasingly higher each year. Because in 2008 the global financial crisis resulted in several countries took tergunjang economy. This condition can be seen in the following graph.



Source: Indonesia Central Berau of Statistic (many years)

Figure 4.2 Share of ICT to GDP Indonesia

The development of ICT is growing in the world, but Indonesia is still in the category of developing countries where the availability of communication is still minimal infrastructure resulted in the opportunity to obtain information and knowledge be more limited. The spread of ICT is relatively uneven, meaning that only limited in big cities are easily enjoy the facilities available communication network. Thus the development of education also becomes uneven and obstructed. One container is considered the greatest role in the ICT world in Indonesia is the internet. The impact on ICT developments urban areas into one medium of learning and information retrieval and knowledge more leverage.

ICT is also related to the development of technology for routine activities, which means the Internet at this time is needed to access the information on communication with the city, between cities, provinces, and between nations. ICT utilization is already widely used by the world community in various fields, such as education with E-Learning concept that allows us to learn anywhere. While the business area called the E-Commerce enables the growth and development ease in entrepreneurship. For example to sell of products so as to increase efficiency in business.

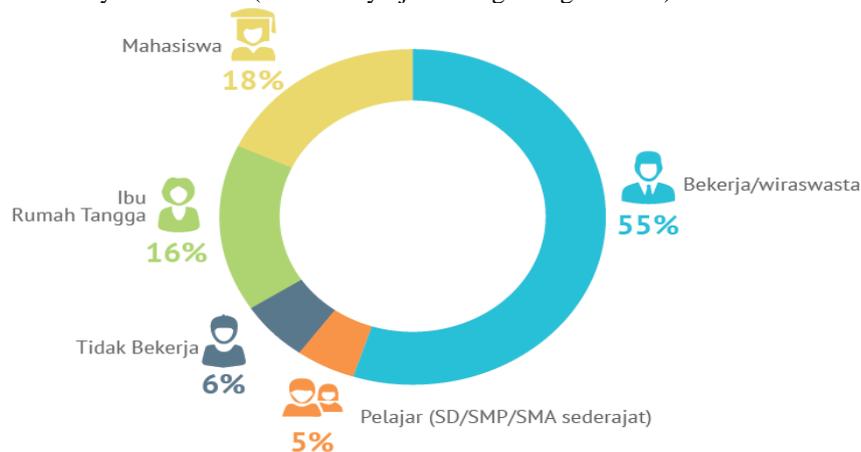
Based on research conducted by the Association for Indonesian Internet Service Provider (APJII) in 2014, found the phenomenon by which most Internet users in Indonesia, where people living as dominant people in western part of Indonesia. This situation can be seen in the following figures of the distribution of Internet users in Indonesian's region.



Source: APJII Indonesia, 2014

Figure 4.3 Distribution of Internet Users in Indonesia

Based on the above picture can be seen the islands of Java and Bali have the most number of Internet users in Indonesia with a total of 52.0 million people. Follow by the island of Sumatra with a total of 18.6 million people in the 2nd sequence. Sulawesi Island as many as 7.3 million people. And last Nusa Tenggara, Papua, Maluku as many as 5.9 million people as well as the island of Borneo is only 4.2 million people. The majority of professions or groups of Internet users in each province, the workers and the self-employed. The entrepreneurs, as number of internet users both are university students and housewives. There's only a few internet users who activity as a student (elementary / junior high / high school).



Source: APJII Indonesia, 2014

Figure 4.4 Percentage of Internet Users According to Activities in Indonesia

2. Method of Analysis Results Regression with OLS

This study uses several variables that will be analyzed through the model of economic growth, such as the Economic Growth (EG), Gross Fixed Capital Formation (K), Number of Internet Users (A), Population productive (L). The results of running the data can be seen in the following table:

Table 4.5

Result of Regression Model

Dependent Variable: PE
 Method: Least Squares
 Date: 02/11/17 Time: 23:52
 Sample: 1998 2014
 Included observations: 17

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.373607	1.210197	-1.135028	0.2769
K	0.359251	0.038391	9.357732	0.0000
A	0.183077	0.081303	2.251794	0.0423
L	1.478732	0.458604	3.224419	0.0066

R-squared	0.893131	Mean dependent var	3.985138
Adjusted R-squared	0.868469	S.D. dependent var	4.602297
S.E. of regression	1.669124	Akaike info criterion	4.064799
Sum squared resid	36.21767	Schwarz criterion	4.260849
Log likelihood	-30.55079	Hannan-Quinn criter.	4.084287
F-statistic	36.21481	Durbin-Watson stat	1.889904
Prob(F-statistic)	0.000001		

Source: Eviews 7 (running data result)

The coefficient of determination (R-Square adjusted) or the goodness of fit of the model showed 86.85% of independent variables (A, K, L) is able to explain the dependent variable (EG), the remaining 13.15% is explained by variables outside the model or variables that are the disturbance error term. This means that variable of the model is consistent with the theory and empirical facts that have been there.

Furthermore, the correlation coefficient (R) which is used to see whether or not a strong linear relationship of the three independent variables on one dependent variable. The correlation value reached 0.931917, or 93.19%, meaning the degree of relationship of free variable to variable tied to a very high proficiency level of the economic growth model. Then the linear regression model becomes:

$$PEt = -1.374 + 0.359 Kt + 0.183 At + 1.479 Lt$$

From the estimation that has result testable variable-variables in order to see the hypothesized effect of variable Kapital, Advances in technology and the number of age workforce to variable economic growth, where the variable gross fixed capital formation (K) and a variable number of productive age population (L) have influence positive and significant at $\alpha = 1\%$ to economic growth. Variable number of Internet users (A) has a positive and significant effect on $\alpha = 5\%$ of economic growth in Indonesia. That is, if the value of gross fixed capital formation increased 1%, it will boost economic growth by 0.36%. While the increase of 1% of Internet users will increase economic growth by 0.183%. 1% increase in variable number of productive age population will increase by 1.479% economic growth in the national economy.

The conclusion that the three independent variables will be able to increase the economic growth resulting from technological advances seen from the use of ICT or internet users. While the number of productive age population it will increase the number of Internet usage back to encourage faster economic growth.

Test diagnostic the classical assumption of the model estimates of this research has been freed of multicollinearity, and autocorrelation heterokedasticity. The results of this model analysis did not reveal any multicolinierity, because there is no sign of the changing of the coefficients or parameters in accordance with the hypothesis, so it can be estimated.

Heteroscedasticity test aims whether in the model occurred inequality variants of residuals of the observations to other observations. If the variance of the residuals of the observations to others still, it is called and if different homocedasticity called heterokedastisitas. Because the residual does not form a specific pattern in other words the residual relatively constant. Autocorrelation can use the results of the Durbin-Watson stat that reached 1.8899 and still enter the specified range.

3. Analysis of Typology Klassen

This study compares the economic growth with the growth of ICT every province in Indonesia using data communication sub-sector growth in the structure of Gross Domestic Product (GDP). Klasen Typology Analysis for Economic Growth with ICT Growth in Indonesia To find out the mapping of the province Klassen typology between economic growth and growth of ICT in Indonesia researcher using SPSS version 18.00. The results obtained will map the location of the quadrants for each province in Indonesia and can draw conclusions from the results as follows :

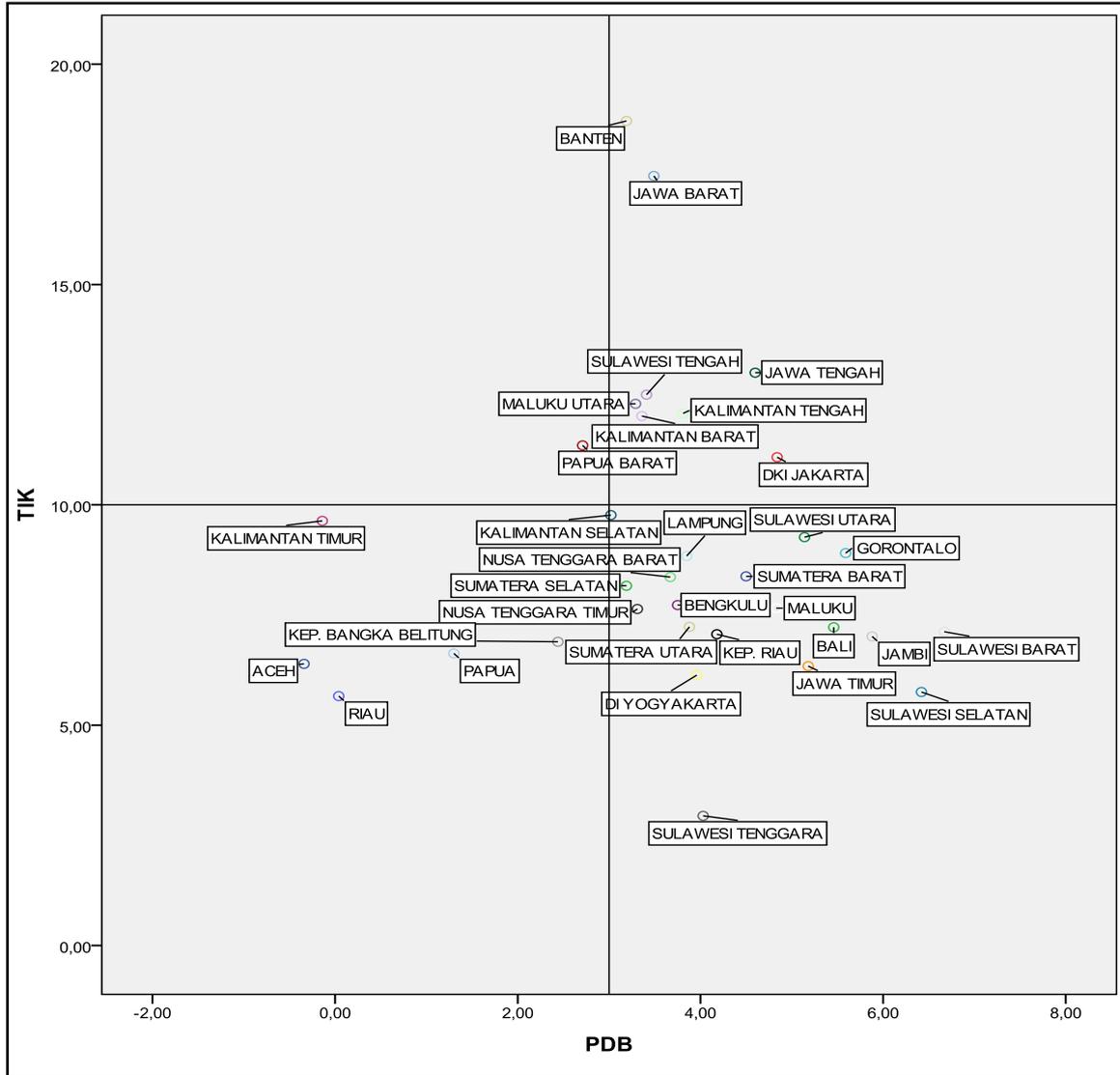


Figure 4.6 Cartesian diagram Klassen Typology Analysis of Economic Growth and Growth of ICT Sector

Table 4.8
Analysis Results Klassen Typology Growth and Growth in ICT Indonesia

(Quadrant II) <i>growing region</i> ICT growth is high but low economic growth	(Quadrant I) <i>Rapid growth region</i> High ICT growth and High economic growth
Province : ■ Papua Barat	Province : ■ Banten ■ Jawa Barat ■ Jawa Tengah ■ Sulawesi Tengah ■ Maluku Utara ■ Kalimantan Barat ■ Kalimantan Tengah ■ DKI Jakarta

(Quadrant III) <i>Relatively backward region</i> ICT growth is low and low economic growth	(Quadrant IV) <i>Retared region</i> ICT growth is low but High economic growth
Province : <ul style="list-style-type: none"> ▪ Aceh ▪ Riau ▪ Papua ▪ Kep. Bangka Belitung ▪ Kalimantan Timur 	Province : <ul style="list-style-type: none"> ▪ Sumatera Utara ▪ Lampung ▪ Sulawesi Utara ▪ Gorontalo ▪ Sumatera Barat ▪ Sumatera Selatan ▪ Nusa Tenggara Barat ▪ Nusa Tenggara Timur ▪ Bengkulu ▪ Kep. Riau ▪ DIY ▪ Jawa Timur ▪ Bali ▪ Jambi ▪ Sulawesi Barat ▪ Sulawesi Selatan ▪ Sulawesi Tenggara ▪ Kalimantan Selatan ▪ Maluku

V. Conclusion

Partially, variable gross fixed capital formation (K), the number of Internet users (A) and the number of productive age population and a significant positive effect and in accordance with the theory of growth in Indonesia with a hypothesis that is also acceptable.

Throughout 1998 and 2014 economic growth in Indonesia is getting better, after the economic crisis that occurred in 1998. While Internet use is also being improved in the same year since the fall of the Suharto regime in 1998 the number of internet users in Indonesia also increased and has a tendency positive.

This study makes Klassen typology analysis between Economic Growth by Sector Growth ICTs for all provinces in Indonesia. Results typology analysis Klassen charted provinsiprovinsi in Indonesia into four classifications or 4 quadrant where high economic growth and the growth of the ICT sector is also high, lower economic growth but the growth of ICT high, low economic growth and the growth of the ICT sector is also low, and high economic growth, but the growth of ICT low.

Klassen typology analysis of the results, the government should pay more attention to provinces that are quadrant III, because provinsiprovinsi located in this quadrant have a low economic growth and low ICT pertumbuhan well. Therefore the government should make policies that are specific to the province in this quadrant.

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