



Information and Communication Technology (ICT) and Firm's Export in Indonesia

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Abstract

In the globalization era, ICT has important role in firm's ability to export their products. The objective of this research is to analyze the impact of ICT on the ability of Indonesia's firm to export their product. Two ICT methods are analyzed, email and website. The data utilized is the secondary data from the Enterprise Survey conducted by the World Bank in 2015 with 1317 firms data. Two analysis is conducted, using chi-square analysis and logit equation. The result indicates that 32 percent of firms using email to contact their clients exported their product meanwhile only 5 percent of firms which do not use email exported their products. In addition, 36 percent of firms with website exported their products meanwhile only 7 percent of firms without website exported their products. Using chi-square analysis, it shows that there is a relationship between ICT and where the firms sold their products, whether in domestic or international market. The logit equation indicates that firm ownership, email and website affects the firm ability to export. Therefore, firms must be pushed towards digitalization in order to compete in the export market.

INTRODUCTION

The use of information and communication technology (ICT) has increased significantly over the years. The role of ICT is supporting countries economic growth as well as reducing poverty (Worldbank, 2016). Meanwhile in business, ICT has made firm to grow, invest and profit more compare with firms not using ICT (Worldbank, 2016). The growth of ICT is one of the driving forces of globalization making nations and business without boundaries (Wild and Wild, 2016). In

addition, ICT has made firm more efficient (OECD, 2004).

ICT also contributes to the competitiveness of a nation. World Economic Forum (2019) includes ICT adoption as one of the pillars as the determinants of competitiveness. Indonesia ranked 50th in the overall Global Competitiveness Index in 2019. Meanwhile in the ICT adoption pillars Indonesia ranked 72nd out of 141 countries. The indicators in the ICT adoption pillars include mobile and fixed telephone usage and internet users.

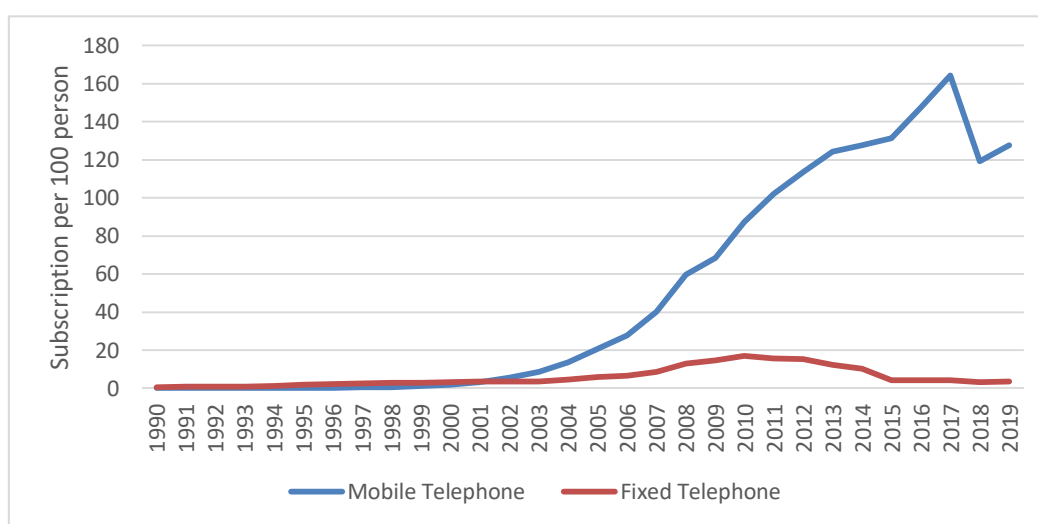


Figure 1. Number of Fixed and Mobile Phone User in Indonesia, 1990-2019

Source: Worldbank (2020)

Indonesia is one of the country with the highest growth of ICT usage especially for fixed and mobile phone. For the fixed telephone, the growth occurred during the 1990s when in 1990 only 0.3 person per 100 person has fixed telephone and the number picked in 2010 with 16.9 person per 100 person who has fixed telephone and beyond the number decrease due to the usage of mobile phone (Figure 1)(Worldbank, 2020). Meanwhile the usage of mobile phone increase significantly during the year 2000s. In 2000 only 1.7 person per 100 person owned a mobile phone and the number increase in 2017 with 164 person per 100 person meaning that one person has more than one mobile phone (Figure 1)(Worldbank, 2020).

The other indicator of the use of ICT is internet usage. The internet usage can be use for personal or business purposes. In 2019, 47,7 percent of individuals use internet which increase significantly since 2000 which only 0.93 percent of the population use internet (Figure 2)(Worldbank, 2020). Although the number increased significantly over the years, but compare to other countries the number is still relatively low. According to Global Competitiveness Report 2019, Indonesia ranked 104 out of 141 countries in 2019. In addition, the increase of internet user is closely related with the mobile phone user which made internet access easier to the public.

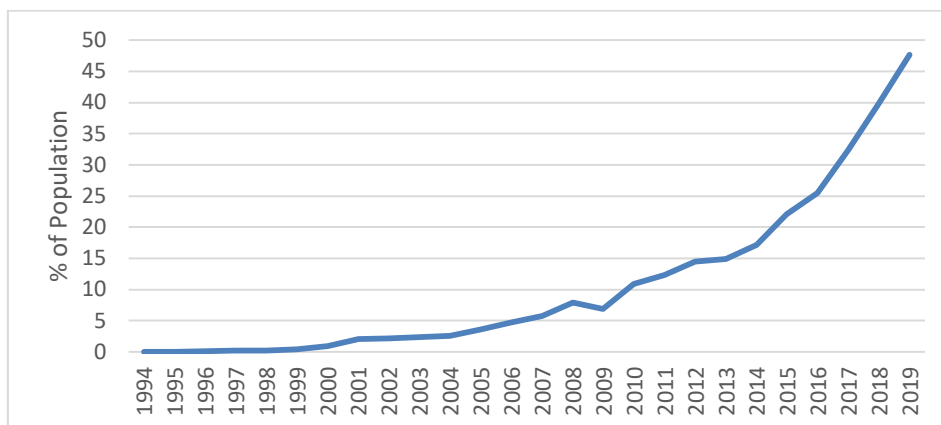


Figure 2. Percentage of Population Individuals Using Internet in Indonesia, 1994-2019
Source: Worldbank (2020)

More comprehensive method to measure the level of ICT is the ICT Development Index (IDI) which is constructed by the International Telecommunication Union (ITU). The ICT Development Index is a composite index which combines 11 indicators into one benchmark measure (ITU, 2009). The index is a number between 0 until 10. The index consists of threesub-indexes and these indexes are explained by several indicators (ITU, 2009), namely:

- ICT infrastructure and access
- ICT use
- ICT skill

In the case of Indonesia, ICT Development Index (IDI) grew between the year of 2010 until 2018 although in some years

it decreased (Figure 3). In 2010 Indonesia’s IDI reached 3.01 ranked 97 out of 155 countries. Meanwhile in 2017, Indonesia’s IDI reached 4.33 with the ranked of 111 out of 176 countries. In 2018, Statistics Indonesia (2019) calculated the IDI for Indonesia and reached the value of 5.07. If the IDI is disaggregated into sub-index, the largest contributor is the ICT skill (5.76), ICT infrastructure and access (5.34) and ICT use (4.45) (Statistics Indonesia, 2019). From this sub-index it can be inferred that Indonesia’s population has the capability of using ICT but has to increase in the subindex of infrastructure and access and ICT use. The indicators of ICT use include percentage of population using internet, mobile and fixed telephone used.

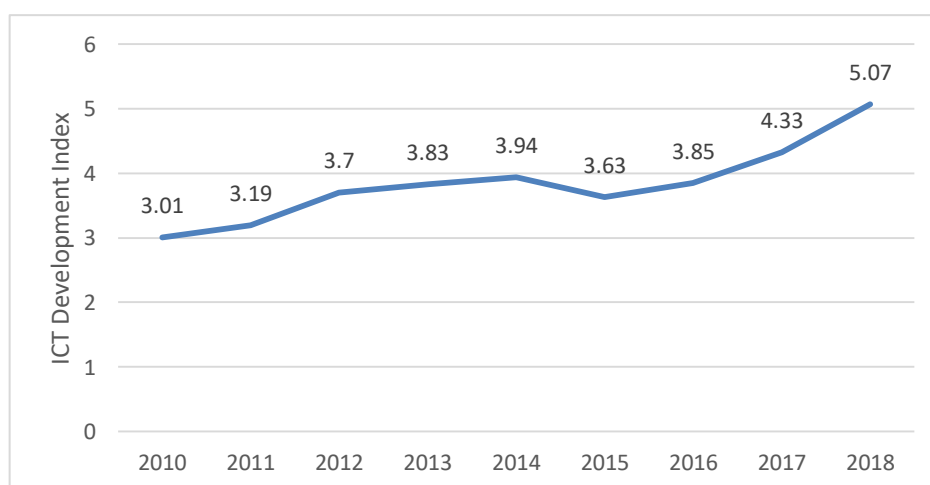


Figure 3. Indonesia’s ICT Development Index (IDI), 2010-2018
Source: International Telecommunication Union (various years) and Statistics Indonesia (2019)

One of the impact of ICT that many scholars has analyzed is on export. The impact can be classified into two level of analysis. The first is the impact of ICT in the country level with the case of one country or several countries which includes articles by Ozcan (2018), Hinson and Adjasi (2009), Xing (2018), Rodriguez-Crespo and Martinez-Zarzoso (2019), Hermawan, Budiyanti and Rivani (2019), Oktora and Muhtasib (2019), Wardani, Azizurrohman and Tanthowy (2019), Soeng (2020), Tee, Tham and Kam (2020), Aryani, Andari and Suhindarto (2020). Most of these articles utilized regression analysis which analyze the effect of ICT variables on export. The ICT variables used varies and not only single variable such as internet users (Oktora and Muhtasib, 2019; Aryani, Andari and Suhindarto, 2020; Rodriguez-Crespo and Martinez-Zarzoso (2019; Soeng, 2020), telecommunication network user (Aryani, Andari and Suhindarto, 2020), mobile phone user (Xing, 2018; Oktora and Muhtasib, 2019; Aryani, Andari and Suhindarto, 2020; Soeng, 2020), index of internet user for business to business transaction (Xing, 2018; Aryani, Andari and Suhindarto, 2020), fixed broadband subscription (Hermawan, Budiyanti and Rivani (2019, Soeng 2020), internet bandwidth (Hermawan, Budiyanti and Rivani (2019), ICT development index from ICT Indicator database (Ozcan, 2018; Wardani, Azizurrohman and Tanthowy, 2019; Tee, Tham and Kam, 2020), fixed telephone user (Xing, 2018, Soeng, 2020).

Ozcan (2018) analyze the effect of ICT on Turkey and its trading partners which shows that ICT has a positive impact on Turkey's export and import although the impact is higher on import activities. For the case of African countries, Hinson and Adjasi (2009) revealed similar result with a one percent increase of internet use will increase firm's export by 2.2 percent.

In the multicountry analysis Xing (2018) using panel of 21 developed and developing countries and 30 OECD countries indicates that better access to modern ICT adoption of e-commerce applications increase trade among

two countries. Meanwhile Irawan (2014) using input output analysis showed that for the case of ASEAN countries the magnitude of the impact of ICT do not depend on how developed is the country but depend on the ICT utilization of the country.

For the cross-country analysis, Portugal-Perez and Wilson (2012) proposed an aggregate indicator for soft and hard infrastructure and analyze the impact on the export performance. The authors concluded that developing the quality of physical infrastructure and ICT will increase export especially for developed countries.

In the case of Indonesia, Wardani, Azizurrohman and Tanthowy (2019) revealed that ICT has positive and significant impact on Indonesia's export to ASEAN countries. Similar result also found by Aryani, Andari and Suhindarto (2020) which indicated with ICT increase Indonesia's export to ASEAN countries although both articles used different ICT variables. Meanwhile for the case of Indonesia's apparel export, ICT do not have any impact on Indonesia's apparel export caused by the wide gap of internet users between region in Indonesia (Oktora and Muhtasib, 2019).

The second level of analysis is in the firm level, Qiang et.al (2006) analyze the impact of ICT on firm performance on several countries using the Investment Climate Survey (ICS) database. The authors concluded that ICT will make sales and employment grew faster and increase investment and profit firms. In addition Machikita et.al (2010) found similar result in the case of four ASEAN countries (Indonesia, Thailand, Philippines and Vietnam) that the introduction of ICT have positive correlation with various business indicators. Although the impact differs between multinational companies/joint ventures and local firm. Fakh and Ghazalian (2014) using logit method found that firm using ICT in their business has higher probability to export in the case of Middle East and North Africa (MENA) region. For the case of small and medium enterprise, research conducted in Zimbabwe by Makanyeza and

Ndlovu (2016) found that SMEs using ICT has positive effect on export activities.

There are still limited studies regarding the relation between ICT use and export especially in the Indonesian case. Qasasi et.al (2019) analyze the effect of ICT on SME's competitive advantage in the case of apparel retailers in Indonesia. The authors indicated ICT make the SME to enhance their capacity. ICT has made SME enhance their supply chain and customer relationship management.

Tambunan and Busnetti (2018) described the internet small and micro business users in Indonesia and found the three characteristics of these businessmen, namely most internet usage is in the manufacturing industry, younger respondents used internet more than older respondents and highly educated respondents used more internet than low educated respondents. Meanwhile Falentina et.al (2020) analyzed the medium and small enterprise in Yogyakarta found that utilization of internet has enabled the medium and small enterprise to improve labor productivity and to conduct export. The strength of phone signal have positive and significant impact of labor productivity and proportion of exports. In addition, in the case of specific firm, Rifin and Naully (2020) found that utilization of internet has made a coffee producer cooperative in Bandung to export their product. The cooperative gained better price by contacting directly to the foreign buyers rather than through exporter although the quantity was much lower.

The objective of this article is to analyze the impact of ICT on the ability of Indonesia's firm export their product. The use of ICT is measured using two parameters, the use of email in their business and the availability of the firm's website in order to promote their products.

RESEARCH METHODS

Two analysis are conducted in order to analyze the relationship between ICT and export. The first using a non-parametric

approach to analyze the correlation between exporting firm and the use of ICT. A chi-square method is used since the variables are in the form of category.

The second analysis deals with the determinants of export activities. Zou and Stan (1998) categorized the determinants of export into three categories, internal-controllable variables, internal-uncontrollable variables and external-uncontrollable variables. The internal-controllable variables include export marketing strategy and management attitudes and perception. For internal-uncontrollable variables include management characteristics, firm characteristics and competencies. Meanwhile the external-uncontrollable variables include industry characteristics, export market characteristics and domestic market characteristics. In this article, the model is based on the internal-uncontrollable variables especially the firm characteristics.

The logit model is conducted using secondary data from the Enterprise Survey conducted by the Worldbank in 2015 with the original data of 1317 firms but after considering the availability of the variables only 494 firms are eligible for the model. The ICT utilized in the model is email and website usage in the form of dummy variable.

Logit analysis is utilized since the dependent variable is binary with the model as follows:

$$L_i = \alpha_0 + \alpha_1 \ln PROD_i + \alpha_2 \ln SALES_i + \alpha_3 DFOR_i + \alpha_4 DEMA_i + \alpha_4 DWEB_i + \varepsilon_i \dots \dots \dots (1)$$

Where; L_i = exporting or non exporting firm (1 = exporting; 0 = non exporting); $PROD$ = number of production worker (person); $SALES$ = production value (Rupiah); $DFOR$ = dummy foreign ownership (1 = foreign share; 0 = no foreign share); $DEMA$ = dummy for email usage (1 = use email; 0 = do not use email); $DWEB$ = dummy for website usage (1 = have website; 0 = do not have website)

The hypothesis is that all of the coefficients are positive.

RESULTS AND DISCUSSION

The first analysis involves analyzing the raw data regarding the relation between ICT modes and export market. Out of 1317 firms surveyed, only 2634 firms were eligible for the first analysis since the data availability. Firms which export their product, wholly or partially, made up 17.5 percent of the total firms meanwhile 41 percent of the total firms either have email or website in their operation. Similar result found by (Tambunan and Busnetti, 2018) in the case of SME's in Indonesia which revealed that 36.9 percent of the respondent questioned do not use internet in their business caused by they feel no need, lack of knowledge and lack of capital.

The data survey also indicated that 32 percent firms using email in their activities exported their product (full or partially exported) meanwhile only 5 percent of firms not using email in their activities exported their product (full or partially exported) (Table 1).

This shows that firms using email in their activities has higher probability to export their product. Email is oftenly used as a communication tool to contact with foreign buyers.

The same pattern also occurs in firms having their own website. Firms who have website 36 percent exported their product (full or partially exported) meanwhile only 7 percent of firms with no website exported their product (full or partially exported). Website is used as a promotion media especially for foreign buyers to obtain information about the firm's products.

In order to analyze the relation between the firm's ICT mode and export market, chi square analysis is conducted. The chi-square analysis indicates that there is a relation between the ICT mode (email and website) and the market orientation indicating that the ICT has contributed to the market orientation especially for export.

Table 1. Firm's ICT Mode and Export Market

ICT Mode	Market Orientation			Total	
	Fully Export	Partial Export	Domestic		
Email	Yes	27	169	414	610
	No	17	18	672	707
Website	Yes	21	148	303	472
	No	23	39	783	845
Total		88	374	2172	2634

The second analysis utilized the logit analysis with the dependent variable is export, partially or wholly (valued 1) or sell wholly in domestic market (valued 0). The result shows three variables are significant: foreign ownership, email and website meanwhile number of production worker and sales are not significant (Table 2). The production workers and sales are not significant indicating that the size of the firm does not determined that the firms conduct export activities. Similar results found by Rifin (2017) for the case of food industry in Indonesia which revealed that the number of production worker did not have any effects on firms' export activities.

Both ICT variables are significant with email has the highest coefficient. Firm using email has 4.70 times probability to export compare to firms not using email, meanwhile for website only 2.46 times (Table 2). The high odds ratio of ICT variables is caused by the relatively low internet use in Indonesia shown by percentage of individuals using internet in 2019 only 47,7 percent (World Bank, 2020). According to Global Competitiveness Report 2019, Indonesia's percentage of individuals using internet in 2019 ranked 104 out of 141 countries. Therefore, a small increase in internet use will have a huge impact on export activities. Meanwhile in the case of MENA region, using

marginal effect shows that using ICT in the business, indicated by the firm use of internet, will increase the probability to export by 35.4 percent (Fakih and Ghazalian, 2014). Firms in China having official website and corporate email will increase the firm's margin when exporting their products (Huang and Song, 2019).

The significant variable of both ICT indicators shows that having email and use the email to contact foreign buyers has more effect compare to having a website. Huang and Song (2019) argued that firm using internet has its advantage and disadvantage. The advantage is that the firm can reduce the cost of international information exchange which eventually increase the probability of new product entering the export market. Meanwhile the disadvantage is that with the establishment of corporate website, consumer in destination countries can conduct product comparisons and therefore increase the competition in the export market. This competition will lead to quality reduction in order to decrease price.

In addition, using website can make the firm presence more recognized through foreign customers both fast and cheap and then this firm can establish virtual branches all over the world without investment in asset and using intermediaries (Kotnik and Hagsten, 2013). Aryani, Andari and Suhindarto (2020) found that ICT adoption in Indonesia and use of E-commerce in trading partner will increase Indonesia's export to ASEAN countries. The result is similar to findings of Lal (2004) which shows that the performance of firms in international market is better when the firm adopted more advanced e-business tools for the case of Indian firms and in the case of Indonesia's apparel export (Oktora and Muhtasib, 2019). In addition, Machikita et.al (2010) for the case of four ASEAN countries (Indonesia, Philippines, Thailand and Viet Nam) showed that firm using ICT in business processes is correlated with business performance especially for export markets and improvement of production management.

Similar results also found in the case of Indonesian SME, Tambunan and Busnetti (2018) found that one of the reasons that SME use internet is to search for market and market opportunities including export market. Meanwhile Rahayu and Day (2017) reported in the case of SME in Indonesia, the use of ICT and e-commerce are still in the early stage including for the purpose of marketing and purchasing and procurement activities. In addition, looking at the different angle, Felantina et.al (2020) looked at the quality of the internet using the strength of signal variable. The greater the strength of the signal, the greater the proportion of export. In the macro level, these findings are similar to Arsani and Sihombing (2018) which indicates that higher individuals using internet will increase Indonesia's export. In addition, the research also showed that after 2017 the ICT indicators has higher impact on export compare to non ICT indicators in increasing Indonesia's export.

Foreign ownership is significant and has the largest coefficient. Firms with foreign ownership has 5.15 times probability to export compare to firms with no foreign ownership (Table 2). This result is similar to the findings of Sjöholm (2003), Rifin (2017) and Naully et.al (2020) for the case of Indonesia. Firms with foreign ownership have foreign network in buying their product and also has the market information regarding their home country (Sjöholm,2003).

Table 2. Logit Equation Result

Variables	Odds Ratio
Constant	0.07
Production Worker (PROD)	0.95
Sales (SAL)	0.97
Dummy Foreign Ownership (FOR)	5.15 ***
Dummy Email (DEMA)	4.70 ***
Dummy Website (DWEB)	2.46 **

Note: *** 1 percent significant level

** 5 percent significant level

*10 percent significant level

The implication of the results indicate that in order to increase export, firm must optimize the use of ICT such as email and website. In order to support the use of ICT, ICT infrastructure must be increased not only in big cities but all over Indonesia. These findings are supported by Felantina et.al (2020) that by increasing the quality of internet will increase export activities. According to the Global Competitiveness Report 2019, Indonesia's ICT adoption still ranked 70th out of 141 countries. In order to improve the ICT adoption, the government must invest in not only infrastructure but only in ensuring the firm to adopt ICT in their business. The ICT development will not only benefit the ICT sector but also act as a catalyst to other sector to grow and eventually to economic development (Kamel et.al, 2009).

According to ICT Development Index, disaggregating the index indicated that the lowest sub-index is in the ICT use. This index refers to the number of individuals using internet. In 2019, only 47.7 percent of

Indonesia's population use internet and increasing this number will eventually increase the use of internet in firms. During covid-19 pandemic, the number of individuals using internet tend to increase especially for students learning from home.

In addition, the ICT condition between province differs based on the ICT Development Index. There are 19 provinces which ICT Development Index are higher than Indonesia's ICT Development Index and 14 provinces are below (Figure 4). Meanwhile the province with the highest ICT Index in 2018 is Jakarta with the index of 7.14 meanwhile Papua Province is the lowest with 3.3. This indicates that the disparity between provinces are still relatively high. The low of ICT Development Index in Papua is caused by the low usage of internet in the province which related with the limited infrastructure of the province (Statistics Indonesia, 2019). Therefore, in order to increase the utilization of ICT, internet infrastructure all over Indonesia must be developed especially in the eastern part of Indonesia.

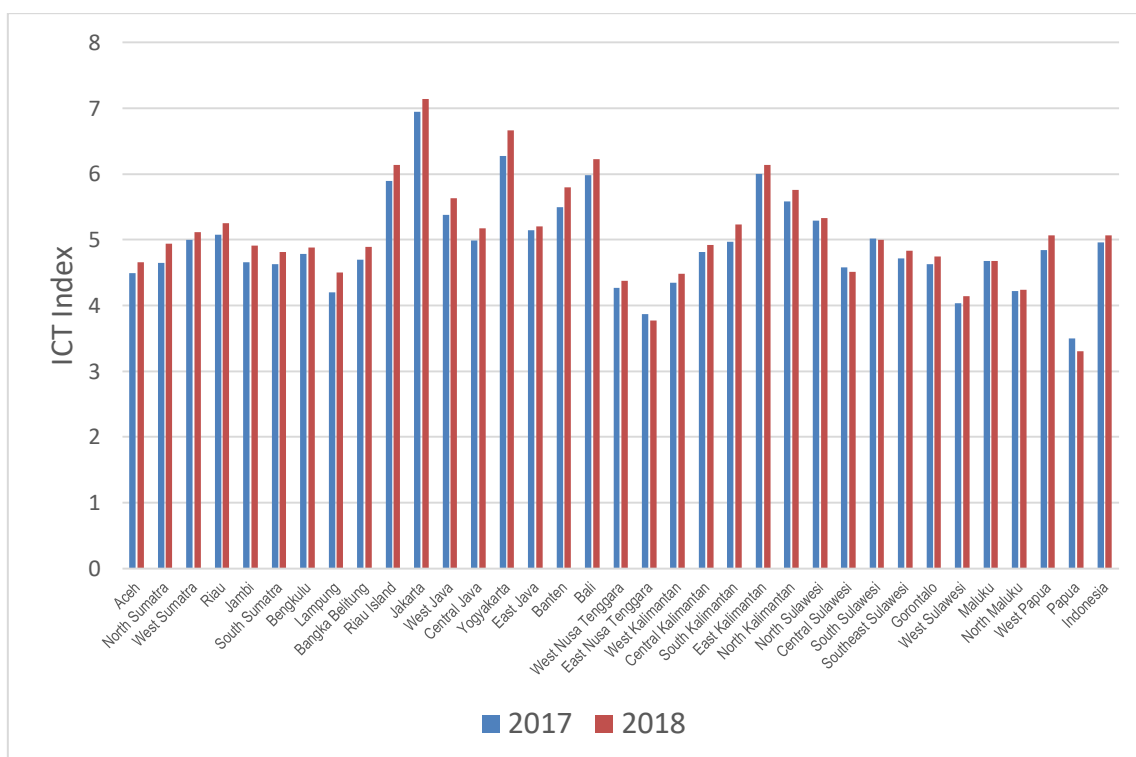


Figure 4. Provincial Level ICT Development Index (IDI), 2017-2018

Source: Statistics Indonesia (2019)

Furthermore, in order to utilize the use of internet, the human resources must be trained to use ICT despite of the size of the firm in order to expand their market. In the next level, not only using email and website, but also other internet activities such as digitalization of their activities in order to compete in the world market.

CONCLUSION

Firms using email in their activity has higher percentage to export compare firms with website. In addition the use of ICT (email and website) has a significant effect on firms to export, the other variable is the foreign ownership. In order to increase the use of internet in firms, it can be conducted through increasing the internet use of individuals. In addition, in order to support firms' market expansion, infrastructure supporting ICT must be more developed to ease the use of email and websites

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