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Study of Indonesian Railway Service's Consumer Behavior in Accessing Information and Communication Technology of the 4.0 Era

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In the era of 4.0, the development of infrastructure of railroad transportation system is facilitated by the use of Information and Communication Technology. This is in line with the increasing needs of users of railway transportation. Train is one of the modes of transportation for Indonesians. Frequency of land transportation users is experiencing an upward trend as service improves as well. Number of users of train services in the period of January-July 2018 reached 242.93 million passengers. It leads to another problem as the ease of users in accessing railroad facilities has not been fulfilled. One of the accesses in need is the availability of Information and Communication Technol This study aims to determine the behaviour of train use in accessing available Information and communication Technology. The methodology is based on behavioura survey of train users. The survey was conducted with 50 respondents at train station. The result of the study shows that train users really need easy information technology services access as part of significant servic in supporting transportation activities.

E-Learning Method to Support Fourth Industrial Revolution

Pelle, W. E.; Ngangi, E.

The Fourth Industrial Revolution builds on the digital revolution, representing new ways in which technology becomes embedded within societies and even the human body. One of the learning method to support fourth industrial revolution is through e-Learning. e-Learning is a generic term for all technologically supported learning using an array of teaching and learning tools as phone bridging, audio and videotapes, teleconferencing, satellite transmissions, and the more recognized web-based training or computer aided instruction also commonly referred to as online course The advantages of using e-Learning are (1) the materi of subjects can be easily accessed of students and teacher; (2) more effective and efficient to access it du to unlimited space and time. In addition, the platform web based internet/online system. The subject materi completed with supplement such as handout provide in Pdf file that can be downloaded. *Framework Moodl* has been using as the computer language program an *Database MySQL* as data saving.

Study of Indonesia Railway Survey Confirmation Behavior in Accessing Information and Communication Technology of 4.0 Era

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Abstract: This paper aims to investigate the impact of railway infrastructure development on the Indonesia national economy. The data used in this study are Gross Regional Domestic Product (GRDP), Railway Assets, Government Budget for Railway, Employee Cost, Consumer Price Index, and Railway Income. The data collected from 10 provinces in Java and Sumatera from 2000 to 2015. Panel data was processed using E-Views 9.0 software. The results of econometric analysis indicate a positive relationship among each variable, development budget, railway assets, railway income and employee cost and Gross Regional Domestic Product which represents the regional and national economy. For provinces in Java Island, the addition of development budget and railway assets will result in a larger increase of GRDP due to the existing railway assets relatively more than on the island of Sumatera so that the services of passenger and freight transport are better. For the provinces of Sumatera Island, the addition of development budget and railway assets will result in a smaller increase of GRDP but for connectivity needs and efforts to reduce logistics costs in the long term it is necessary to build Trans Sumatera rail network linking all provinces on the Island Sumatra. From these analyzes can be suggested policy implementation by prioritizing the development of railway infrastructure to increase GRDP. The development of railway infrastructure in the islands of Sumatera is expected to further increase GRDP.

1 INTRODUCTION

Transportation is a basic need for people to mobilize people or goods, with a scale that are regional, national, or between countries. Transport modes include road, rail, river and lake, sea and air transportation. Indonesia as an archipelagic country, the role of transportation is very important to connect all regions of the country. Indonesia is a country in a cross position between two continents and two oceans, transportation has a strategic position in providing support for political, economic, social and cultural aspects.

In the political aspect, transportation is directed to become a unifying vehicle of the nation within the Republic of Indonesia as well as supporting the activities of central and local government. In the field of economy, transportation serves as the main supporter of goods and services distribution activities in order to realize economic stability, minimize disparity between regions and increase competitiveness, especially for industrial activities, trade and investment. In the social aspect, transportation can play a role to provide mobility support and community accessibility in social interaction activities, strengthening relationships and facilitating the community especially in remote and rural areas. In a cultural perspective, transportation is directed to provide accessibility support in the tourism sector, cultural and religious activities. In the economic system, transportation is referred to as derived demand, meaning transportation is necessary because of other activities. Transportation needs will increase with increasing economic activity and decrease in case of economic downturn.

The economic benefits of transport infrastructure investment are long-term competitiveness, productivity, innovation, lower production prices, and higher revenues. Investment in transport infrastructure also creates thousands of jobs in the near future. A well-performing transport network opens up employment, enabling businesses to grow and lower down the price of home appliances. This will make the entrepreneurs to manage the stock of goods well and efficiently. Transportation makes it easy for suppliers to market their products, making it more cost-effective for industry to keep their production going.

Table 1. Contribution of transportation sector in the total output in 2015

No.	Transport Modes	GDP (Rp. Billion)	% GDP	Share of modes Transportation (%)
1.	Road Transport	193.257	2,22	55,41
2.	Rail Transport	2.950	0,03	0,84
3.	River, Lake and ferries	10.222	0,12	2,93
4.	Sea transport	30.173	0,35	8,65
5.	Air transport	57.185	0,66	16,40
6.	Warehouse and support	54.983	0,63	15,77
7.	**Transportation**	348.770	4,01	100
8.	**Gross Domestic Product (GDP)**	8.695.000	100,00	

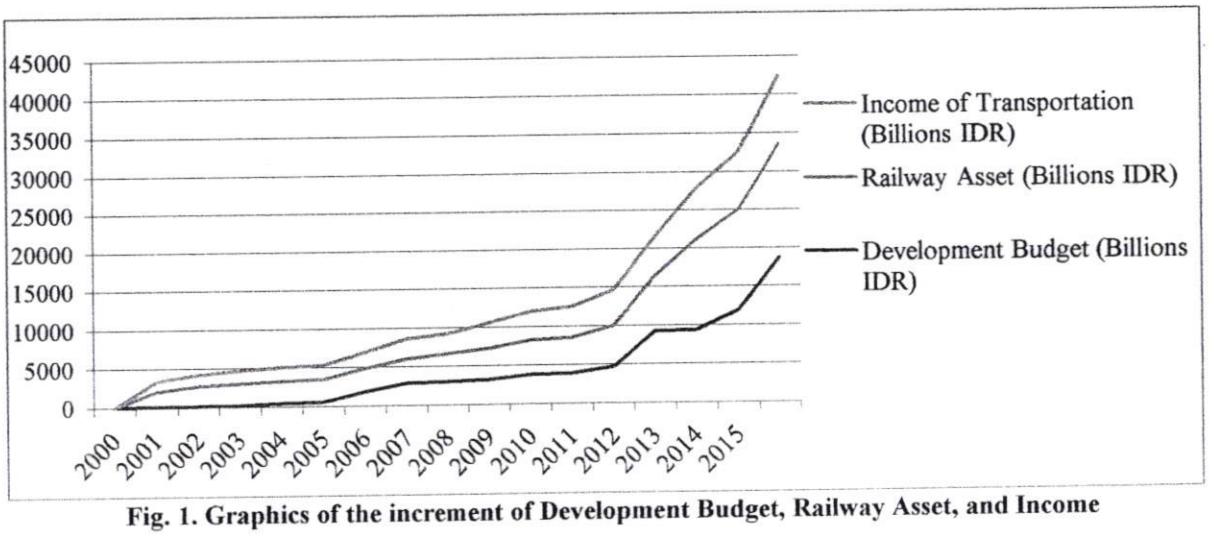

Fig. 1. Graphics of the increment of Development Budget, Railway Asset, and Income

Railway transport has certain characteristics and advantages, especially in its ability to transport both passengers and goods in bulk, energy saving, space-saving, high safety, low pollution (more environmentally friendly) and more efficient than road transport. The railway system is a mass transportation that can be used for the transportation of passengers and goods in large quantities so that it's more efficient than the road transport.For urban transport, transportation costs have a significant contribution to economic activity, for example in Jabodetabek area, rail transportation gives a very real role. The number of Jabodetabek commuter train passengers in November 2017, averaging 1.1 million passengers a day (PT. KAI, 2017).

As shown in Table 1 above, the contribution of the transportation sector in the formation of Gross Domestic Product (GDP) is 4.01%, while the railway transportation 0.03%. For the share of transportation mode, road transport dominated by 55.41%, while rail transport was by 0.84%. Despite the fact the value of the contribution of railway transportation sector is low enough, the development of railway in Indonesia shows a significant growth as in fig.1.

In the period of 2006 to 2016, the average annual growth of passenger transportation is 9%, while the average annual growth of freight transport is 8% (PT. KAI, 2016). In essence, the focus of government policy in the field of freight and passenger transportation is to optimize the role of each mode of transportation in an effort to minimize costs and externalities. The policy is carried out through the integration of a number of modes of transportation in accordance with their respective comparative advantages.

This journal aims to investigate the role of rail transportation and four other transportation sectors in Indonesian economy for period 2000 – 2015 using Econometric analysis to provide policymakers with a basic picture of the role of rail transportation sector compared with other sectors.

2 REVIEW OF ECONOMETRICS

A study finds empirical evidence of the importance of developing transport infrastructure in accelerating productivity and economic development, particularly for African countries (SeetanahBoopen, 2009). In line with that (Akanbi Bosede, et al, 2013) found that transportation infrastructure has a statistically significant and

positive relationship with economic growth in Nigeria. This means that improving the transport infrastructure will boost economic growth.

Rong-Her Chu and Yu-Chang Lin, (2012) concluded that the relationship of the transport industry in Taiwan is stronger in absorbing related industrial products than the products used as inputs in other industries. Road, rail and air transport have a strong ability to attract other industries. The effects of the transport sector triggered production high enough and increased from 2.80% in 1991 to 19.41% in 2006. The highest effect was road transport whereas the lowest was water transport, but water transport had the highest effect on job creation, followed by the air transport and warehousing sectors.

Transport infrastructure investment in economic development is important as a means to facilitate the mobility of goods and services that facilitate the relationship between remote and growth centers. Smooth flow of goods and services will stimulate economic activity resulting in an increase in household income (Glen Weisbrod, 2009). Increased production activities in the transportation sector affect the activities in other sectors, so as to provide an increase in the economy of the community. The effectiveness of investment in transport infrastructure to improve the economy and provide benefits to the community depends on the utilization of transportation facilities by producers and consumers as well as the leading sectors.

Jin Wang, Michael B, and Charles, (2006) studied that the rail and water transport sectors resulted in a significant change in sectoral prices in the energy resources sector. This reflects the high dependence of these sectors on the rail and water transport sectors.

(Hideo Fukushi, 2010) in Thailand resulted there is a growing phenomenon of transportation costs of road transport. This phenomenon leads to shifting modes of transportation from road to other modes. The mode of rail transport is considered as one of the solutions to the problem. The development of rail transport modes and water transport has great potential to boost Thailand's economy through reduced logistics costs.

Ina Drejer (2002) has conducted a research of the characteristics of different attempts to operate the Hirschman original concept in relations with forward and backward with an inception of Rasmussen Dispersion Index and shift into what is called the interrelated measurement of Hirschman-Rasmussen. Empirical analysis employed with input-output Denmark data of the periods of 1966 to 1992 demonstrates a high stability rate from time to time from the individual interrelatedness, yet the key to the industry "power" becomes weak.

Rebecca Bess dan Zoe O. Ambargis (2011) states that if input-output model is accurately adopted, the model can be a very beneficial tool to predict the impact of the whole economy from the initial conversion of the economic activities. To enable to use this model effectively, the analyst has to collect detailed information about the project or program being studied. This paper focuses on the information assumption needed to use a comparison of regional input-output accurately, particularly a multiplier yielded in Regional Input - Output Modelling System (RIMS II).

Ramirez and Esfahani (2002) conducted a study on the relationship between infrastructure and economic growth in some developing countries of which Latin America, East Asia, South Asia, and more. In this study developed a model that shows the economic production opportunities represented by the aggregate output, with several factors such as labor, infrastructure assets, non-infrastructure capital, and other factors that influence.

Atack et. al (2009) conducted a study of the impact of railways on economic growth in the Midwest of America from 1850 to 1860. At that study Atack made the percentage of urbanization and population growth rate as an indicator of economic growth. In this study, the data used is divided into two groups namely "treatment group" and "control group". Testing of data was first performed by looking at changes in urbanization and logarithmic percentage of the growth rate of 1850 that railways services have not been available to the year 1860 where railway services have begun to be used. In addition, there is also a search for linear probability regression with both factors and given the addition of factors resulting from agricultural activities. Furthermore, there is also a regression of linear probability with one of the controlled variables. The last step is to do a first phase regression cross section to predict the treatment and regression phase two to determine the value of treatment. The result of this research is that railway services have a significant impact on the growth of urbanization but less influence on the rate of population growth. The existence of these rail services increases the fraction of the urban population from 3 to 4 percent.

Herranz - Loncan (2011) has examined the contribution of rail transport to economic growth in Latin America covering the countries of Argentina, Brazil, Mexico and Uruguay. The influence of railway transportation on the economic growth of each country is different, for example in Uruguay the influence is very small compared to other countries including European countries namely England and Spain. The low influence of railways in Uruguay is due to the geographic factors and economic structure of the country.

Bogart and Chaudhary (2013) conducted research on the contribution of rail transport to the Indian economy. From the results of his research, rail transport with a wide network in India is very

instrumental for passenger and goods transportation including raw material transportation and the production of factories in India.

Apanisile and Akinlo (2013) conducted research on the relationship between railway construction and economic growth in Nigeria in 1911 - 2011. From the results of his research there appears to be a positive relationship between investment in the rail sector with economic growth in Nigeria. Other research results show that in Nigeria there is a strong relationship between GDP, Capital, State Investment, rail transport production and inflation. Furthermore, to obtain a mathematical equation derived from the Solow growth model:

$$Y_t = A_t K_t^{\alpha} H_t^{\beta} L_t^{1-\alpha-\beta} \quad \ldots\ldots (1)$$

in intensifmodel :

$$Y_t \text{-->} y_t = A K_t^{\alpha} h_t^{\beta} \quad \ldots\ldots (2)$$

$$\ln y_t = \ln A_t + \propto \ln k_t + \beta \ln h_t \quad \ldots\ldots (3)$$

In order to introduce the infrastructure components, Ijaiya and Akanbi (2009) and Esfahani and Ramirez (2003) stated that human capital capital is decomposed as follows:

$$\ln h_t = \ln GE_t + \ln RA_t + \ln INF_t \quad \ldots\ldots (4)$$

with substitute equation 4 to equation 5:

$$\ln y_t = \gamma_1 + \gamma_2 \ln k_t + \gamma_3 \ln GE_t + \gamma_4 \ln RA_t +$$

$$\gamma_5 \ln INF_t + \varepsilon_t \ldots\ldots (5)$$

Economic change is stated in :

$$\Delta y_t = f(\Delta k_t, \Delta h_t) \quad \ldots\ldots (6)$$

$$\Delta \ln y_t = \gamma_1 + \gamma_2 \Delta \ln k_t + \gamma_3 \Delta \ln GE_t +$$

$$\gamma_4 \Delta \ln RA_t + \gamma_5 \Delta \ln INF_t + \varepsilon_t \quad \ldots\ldots (7)$$

where :
y_t = GDP
INF_t = Inflation
k_t = Capital
RA_t = Rail Output
GE_t = Government Budget on Railway
ε_t = Error.

Banerjee, Duflo and Qian (2010) examined the effect of transportation network access to the local economy in China during the years 1986-2003. The results showed a positive relationship between the transport network with a growth rate of GDP per capita.The results of William E. James and Natsuki Fujita (2000) suggest that manufacturing exports have responded positively to trade reforms in Indonesia during the study period (1985-95). Manufacturing exports, in turn, have generated additional employment both directly and indirectly through inter-industry linkages. Furthermore, it is estimated that the employment effects of manufacturing exports in two sub-periods, 1985-90 and 1990-95, using an input-output table (I-O) in 1995.

Abhijit Banerjee, Esther Duflo and Nancy Qian (2010) in their study estimated the effect of access to transport networks on regional economic outcomes in China over twenty periods of rapid revenue growth. The research also addresses the problem of endogenous network placement by utilizing the fact that this network tends to connect historic cities. The results show that proximity to transport networks has moderate positive causal effects on per capita GDP levels across sectors, but has no effect on per capita GDP growth.

GoharBadalyan, Thomas Herzfeld and MiroslavaRajcaniova (2014), stated that providing efficient, reliable, and affordable infrastructure is critical to economic growth, transport infrastructure in particular, vital to regional prosperity. To know the relationship and causality direction between transportation infrastructure, investment in infrastructure and economic growth, cointegration panel analysis and panel causality analysis for three countries of Armenia, Turkey and Georgia were used. Data used in the annual data of Armenia, Turkey and Georgia for the period 1982-2010. From the analysis results proved the existence of more than one vector cointegration which indicates that the system under study is in more than one direction. The results show that the formation of gross capital and transported goods has a statistically significant and statistically significant impact on economic growth in the short term. Overall, there is a two-way causality between economic growth and infrastructure investment, and between road and rail passengers brought in and infrastructure investments shown both in the short and long term.

3 RESEARCH METHODOLOGY

The model used to see the effect of the independent variable with the dependent variable is the regression model. The regression model made will adopt existing models in previous studies. For analysis of growth model (econometric analysis) panel data of each variable from 2000 to 2015 is processed using Eviews 9. One of the journals that discuss about the research of the influence of rail transport to the national economic development is a journal written by Apanisile Olumuyiwa Tolulope and AkinloTaiwo which entitled "Rail Transport and Economic Growth in Nigeria (1970-2011)".

Based on the above research, further adjustments were made to enable the model to be able to describe the situation in Indonesia well. Independent variables affecting the model developed by Akinlo are capital, government spending on rail lines, rail transport output and inflation. Modifications made to the growth model used in this study are using asset variables, development budget, employee costs and income PT. Kereta Api Indonesia.

In the modified growth model, the capital variable is represented by railway assets obtained from the Ministry of Transportation and PT. Kereta Api Indonesia, while the variable of government expenditure is represented by the railway development budget which is also obtained from the Ministry of Transportation and PT. Kereta Api Indonesia. In addition, production (output) is represented by the income of the dependent variable represented by the Gross Regional Domestic Product of the transport sector for provinces in Java and the provinces of North Sumatra, West Sumatra, South Sumatra and Lampung obtained from the Central Bureau of Statistics.

Data processing growth uses data from 2000 to 2015 and is concentrated in the islands of Java and Sumatera, since railway lines are only available on the islands of Java and Sumatera. For Sumatera, only North Sumatera, West Sumatera, South Sumatera and Lampung provinces are panel data per province. Panel data is used because it is a combination of time series and cross section data.

The growth model as follows :

$$\ln GDRP_{ti} = C_1 + C_2 \ln Asset_{ti} + C_3 \ln Budget_{ti} + C_4 \ln CPI_{ti} + C_5 \ln EC_{ti} + C_6 \ln Revt_{ti} + \varepsilon_t \quad (8)$$

where :

$GDRP_{ti}$ = Gross Domestic Regional Product
$Asset_{ti}$ = Railway Asset
$Budget_{ti}$ = Railway Government Budget
CPI_{ti} = Province Consumer Price Index
EC_{ti} = Employee Cost of PT. KAI
$Income_{ti}$ = Passenger and Cargo Income
ε_t = Error
t = time(year)
I = Province (1,2, ..., n).

4 EMPHIRICAL RESULT

From regression result with fixed effect model still has autocorrelation problem because Durbin-Watson value is 0,379413. One way to overcome the problem of autocorrelation problems can be done with the method EGLS (Estimated Generalized Least Square).

There is an increase in the Durbin Watson coefficient value to 1.508077. Although the DW value has increased, but still in the region of doubt, for that need to use another model for the problem of autocorrelation can be overcome. In this research, Error Correction Model (ECM) has been done. However, the regression obtained through ECM gives a low significance value and there are variables whose coefficient value is minus, although the DW value is obtained above 2. So the authors conclude the best model of this research is by EGLS method, DW value is in hesitant region because the data in this study is a combination of cross section and times series data so that autocorrelation test should not be done.

Furthermore, the feasibility test of the model can be summarized as follows:

1) In F test ,prob score F count <5%, it means the model is feasible to use.

2) In t test, the value of prob t arithmetic each variable is <5% means free variable significantly influence on the dependent variable. Only variable cost of employees whose value is above 5% means that the effect is not so significant to the GRDP.

3) On Determination test, seen from adjusted value R2 = 99,99% means that the four variables give influence of 99.99% to the dependent variable.

From the econometric analysis, it is found that the biggest influence on GRDP in the railway sector is CPI and Asset. CPI, of course, gives effect to GRDP in any sector. The influence of the number of railway assets is very influential to the increase of GRDP, because Asset is a supporting activity of a sector. By increasing the number of sets in the railway sector it gives a significant increase to the increase in the national economy which is marked by the increasing value of GRDP. Increased Assets are carried out through the construction of railway infrastructure (railways, stations and operating facilities) and the provision of railway facilities (locomotives, trains and carriages).

For provincial constants stated that for the provinces in Java with constant positive constants means the addition of development budget and railway assets resulted in larger increases in GRDP. For the provinces of Sumatra Island with negative constant constants, the addition of development budget and railway assets resulted in a smaller increase of GRDP.

Table 2. EGLS Regression Output

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.589601	0.147000	65.23548	0.0000
Ln(Budget)	0.002783	0.004116	0.676090	0.5007
Ln(Asset)	0.036560	0.013481	2.712008	0.0080
Ln(Employee Cost)	0.006241	0.016827	0.370894	0.7116
Ln(CPI)	0.671517	0.042541	15.78507	0.0000
Ln(Income)	0.016635	0.011106	1.497859	0.1376
AR(1)	0.709645	0.052505	13.51586	0.0000
Fixed Effects (Cross)				
West Jawa—C	0.580363			
Jaka-Ban—C	0.887859			
Central Jawa—C	0.233628			
East Jawa—C	0.620266			
South Sumatera—C	-0.472092			
West Sumatera—C	-1.468972			
North Sumatera—C	-0.381051			

Weighted Statistics

R-squared	0.999332	Mean dependent var	13.44472
Adjusted R-squared	0.999245	S.D. dependent var	2.385599
S.E. of regression	0.022599	Sum squared resid	0.046988
F-statistic	11464.66	Durbin-Watson stat	1.508077
Prob(F-statistic)	0.000000		

Unweighted Statistics

R-squared	0.999378	Mean dependent var	13.04435
Sum squared resid	0.047420	Durbin-Watson stat	1.485408

5 CONCLUSIONS

On a regional scale, it is simulated that if carried out the development in the railway sub-sector will have the following effects:(1) There is a positive correlation between development budget variable, railway assets, income, employee cost and CPI to GRDP.(2) For provinces in Java Island, the addition of development budget and railway assets will result in a larger increase of GRDP due to the existing railway assets relatively more than on the island of Sumatera so that the services of passenger and freight transport are better.(3) For the provinces of Sumatera Island, the addition of development budget and railway assets will result in a smaller increase of GRDP but for connectivity needs and efforts to reduce logistics costs in the long term it is necessary to build Trans Sumatera rail network linking all provinces on the Island Sumatra.

From these analyzes can be suggested policy implementation by prioritizing the development of railway infrastructure to increase GRDP. The development of railway infrastructure in the islands of Sumatera is expected to further increase GRDP.

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