

# How relation between Information technology transport infrastructure and logistics transport development: empirical case in Ho Chi Minh

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**Abstract:** Our lives today are heavily dependent on information technology. Especially economic activities, logistics transport sector is not exception. The objective of paper is to measures the role of information technology infrastructure (ITI) in development of logistics transport by assessing the impact of six independent variables of ITI on logistics transport development which using multivariate regression (MR). The main findings are Labour goods productivity is impacted by number of broadband subscriptions and international internet traffic. Labour passenger productivity is impacted by number of safe Internet connections and number of broadband subscriptions. Capital goods productivity is impacted by number of safe Internet connections and number of ADSL internet subscribers. Gross domestic product is impacted by number of ADSL internet subscribers, international internet traffic and number of mobile network subscriptions.

**Key words:** information technology, infrastructure, logistics, transport, development, HCM, Ho Chi Minh City, Vietnam

## I. Introduction

The development of information technology in the 4.0 revolution is becoming stronger day by day, it plays a big role in all our activities. It is a link connecting the various areas between economic, social, cultural activities. information technology, technical technology and even new technology trends have also been changed our life drastically. IT determines many aspects of the socio-economic development. The logistics transport industry is now facing the challenges of digitalization, infrastructure modernization, and intensification of the use of existing lines. In order to carry out the transportation process, the railways of Russia which are equipped with various technical devices and means, that includes various devices of railway automation. Simultaneously with the development of new control systems, the introduction of new information technologies of operational work is taking place (Vakulenko, Kurenkov, Chebotareva et al., 2021). Rudra P. Pradhan, Girijasankar Mallik, Tapan P. Bagchi (2018) confirm that "Embellishment of information and communication technology infrastructure – an apparent imperative in an economy's information technology policy formulation – for both fixed broadband and internet users causes a boost in the per capita GDP". The growing demand for adaptive and efficient Wi-Fi offloading technology, which requires improvement of existing algorithms. It has been becoming more and more important. Wi-Fi – LTE is considered as solution for vehicle communications infrastructure. That is necessary in order to continue to develop economically justified and beneficial solutions for future transport infrastructure networks (ArnisAncans, Ernests Petersons, GuntisAncans et al., 2019). Julia C. Bendul, Alexander C.H. Skorna (2015) found that "There is a common co-existence of risk management and risk orientation practices, product sensitivity and complexity in logistics industry. At the same time, highlighting the importance of information and communication technologies as well as transparency and their application in logistics transport infrastructure in the developed countries in the European Union (EU).

The objective of this paper is to assess the role of ITI in transport logistics infrastructure by measuring the relations between six independent variables of ITI and Labour goods productivity, Labour passenger productivity, Capital goods productivity, Capital passenger productivity and Gross domestic product, the case of Ho Chi Minh, Vietnam (HCM). Paper has eight sections which are introduction is section 1, literature review is presented in section 2, section 3 will be methodology including 3.1 study framework, 3.2 variables of study model, 3.3 Multivariate regression

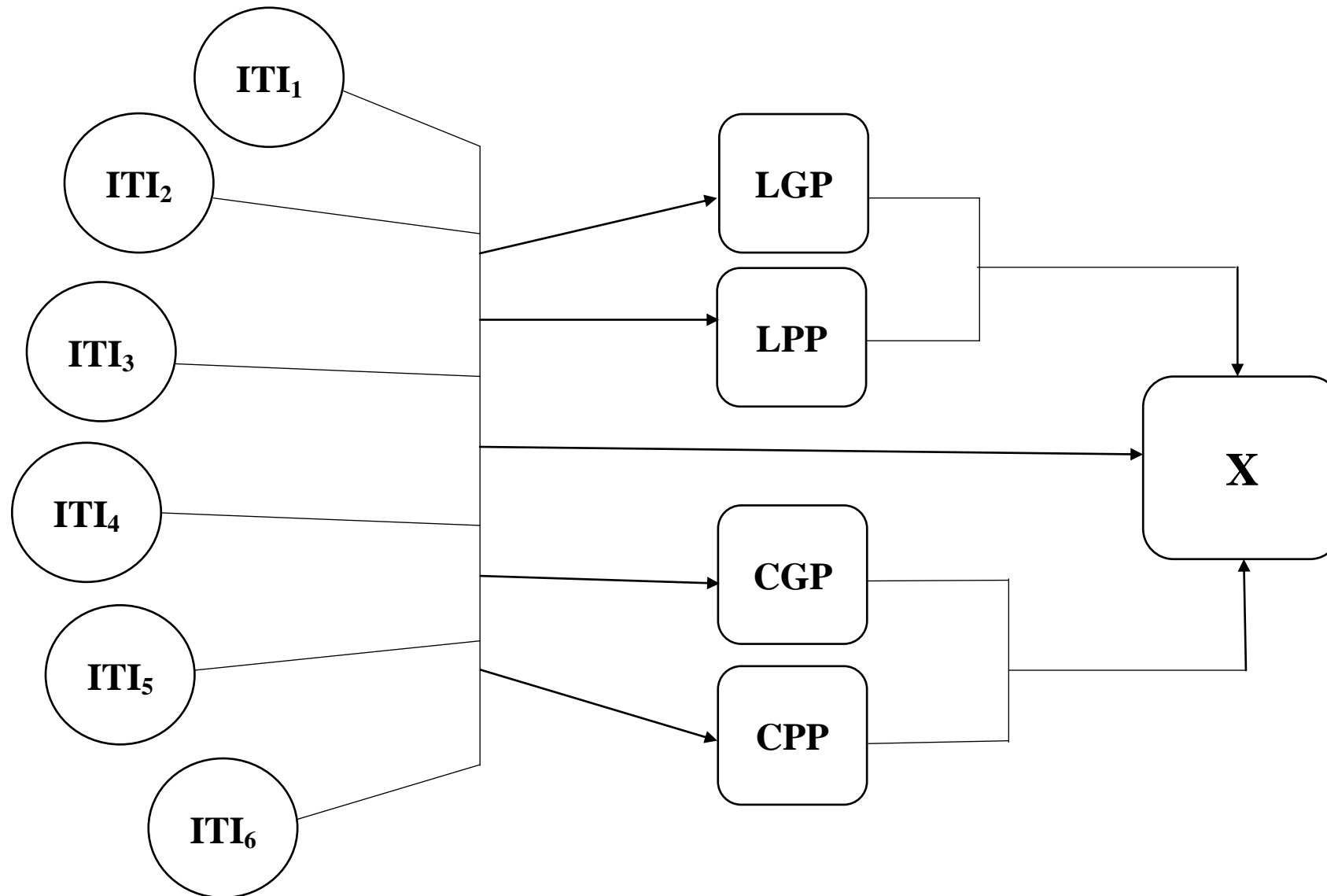
model, section 4 is talked about information technology infrastructure, section 5 will be data source, the study results will be described in section 6, discussion will talked in section 7, and section 8 is final to have conclusion.

## **II. Literature review**

According to Dmitry Gura, Ivan Markovskii, NafsetKhusht et al., (2021) that "A complex for monitoring transport infrastructure facilities based on the joint use of video cameras and laser scanners as a permanent and periodic source of information about engineering structures, respectively. Also, the technology of computer vision, neural network algorithms and artificial intelligence methods in relation to the field of monitoring are discussed in the paper". There is a normal mistake is that small and medium-sized businesses do not coordinate the development of their enterprises with the plans for the urban infrastructure development, and do not pay any attention to the development of transport infrastructure. Transport and the transport sector affect the location and efficiency of production itself, the solution of socio-economic problems, the cost of production, as well as the formation of local and national markets. It is necessary to pay attention to "Smart city" as well as the development of technology improving the information technology that is to ensure high performance of all areas and services that are provided by information technology supporting to logistics transport infrastructure to have positive impact on the economy (Vladislav Uskov, Oleg Kharchenko, 2021). Modern urban cities need to solve issues of transport infrastructure deterioration due to a drastic increase in the number of cars while the state of street and road networks stays the same. If there are no possible solutions in the implementation of transport infrastructure, it will lead to the degradation of the existing street and road network, traffic jams, and, as a result, economic losses. Provides an overview of solutions for the transport infrastructure of the St. Petersburg agglomeration using smart city technologies is necessary (Galina Tokunova, Marlena Rajczyk, 2020). Sophia Becker, Paula Bögel, Paul Upham (2021) said that "Generally, sociotechnical change requires that agency is exercised across multiple, connected levels or contexts. In Berlin, Germany, the construction of a common identity among varied actor groups has been key to a citizen campaign for safe cycling infrastructure. Urban design integration and model of computer are promising ways to provide both qualitative and quantitative support to decision-makers to achieve holistic urban plans incorporating transport infrastructure (Liu Yang, Koen H. van Dam, Arnab Majumdar et al., 2019). Designing the telecommunication element of the transport (electronic) network of the transport infrastructure system and forming a structural block-diagram and the architecture of the system are reasonable choices of finishing measuring equipment, methods and means for allocation in the field (Igor Pugachev, Yuri Kulikov, Apolenary Yarmolinsky, 2018). According to A.A. Fedoseev, O.K. Golovnin, T.I. Mikheeva (2017) that "The methods are intended for informational support in the process of transport infrastructure model construction which represented as thematic layers of the electronic map in a specialized intelligent transport geographic information system. These approaches to the processing of hyperspectral information aimed at the identification and classification of transport infrastructure objects as well as the definition characteristics and condition of the pavement. The solutions can be integrated into the contour of thematic processing and the chain of creating basic products oriented on remote sensing information to create specialized thematic layers used in solving practical problems in the transport infrastructure". Rui Esteves, Paulo Alves (2013) conclude that "Information Technology Infrastructure Library is useful for increasing the overall quality of Information Technology services, reduced costs, improved customer satisfaction, improved productivity and delivery, but it has found that particularly in the public sector there is a natural resistance to change". Intelligent transport systems have advantages that enable secure road traffic, reducing the number of road traffic accidents and death rate on roads. And it enables automatizing the processes of gathering context data on road accidents and performing their processing in real time scale with the purpose of dynamic response on changes in transport situation (Igor Malygin, Vladimir Komashinskiy, Oleg Korolev, 2018). Bernard Gyergyay, Syrus Gomari, Markus Friedrich et al., (2019) supposed that "Automation-ready framework" that provides a planning framework for urban road authorities to prepare for the introduction of connected and automated vehicles on the transport and infrastructure. They complement and coexist with conventional vehicles, public transport, pedestrians and cyclists, to achieve and support higher sustainable mobility goals". As in study by Fabio Tosti, Valerio Gagliardi, Fabrizio D'Amico et al., (2020) that "Ground Penetrating Radar is a well-established technology among the available non-destructive testing methods for the collection of ground-based information to maintain the highest operational safety standards, it is crucial that surface and structural deformation caused by geophysical natural hazards and human-related activities in linear transport networks such as highways and railways are monitored and evaluated. Concurrently, the space-borne Interferometric Synthetic Aperture Radar is another well-known viable methodology for large-scale investigations of road network surface deformations". New methods and technologies are changing the sectors of engineering and constructions. Infrastructure Building Information Modelling is being researched to point out a management information system of digital processes for infrastructures. The 3D parametric solid model of Lamezia Terme International Civil Airport's runway located in Southern Italy is as an example, the 3D parametric model, including

horizontal, vertical profiles and cross sections, was carried out using Autodesk Civil 3D, while the territorial context was recreated in Autodesk InRoads360 (Francesco Abbondati, Salvatore Antonio Biancardo, Sabrina Palazzo et al., 2020).SvyatoslavSeliverstov, YaroslavSeliverstov, Bogdan Gavkalyk et al., (2020)recognizethat "The main infrastructure element in the organization of the planning structure of a city is a city block, and the efficiency of the entire urban transport system depends on the development of its transport infrastructure. The structure of a city block as an assembly unit of the urban environment is analyzed in terms of provision with transport. A new form of city block organization is proposed. The city block structure is formally described. A new definition for a "basic city block" is introduced. A transport infrastructure organization method and model for cities with growing effectiveness are developed".According to Nina Sirina, Svetlana Yushkova (2021) that "A comprehensive scientific and technical project "Digital Railroad" developed by the Russian Railways holding company, discloses the relationship of the digital railroad with the digital economy. Goals and technological solutions of the Digital Railroad project on infrastructure in the context of the implementation of the polygon principles for managing the transportation process. The software for the formation of digital parameters for the safe operation of the infrastructure was implemented in the Automated Operational Management System for the Unified Infrastructure Management Centre and was set up to transform the activities of industry organizations".The structure of the air tunnel was developed on the basis of a new hybrid material made of cellular polycarbonate and optical fibre, specially synthesized with purpose for the safe use of unmanned aerial vehicles at transport infrastructure facilities were formulated. That is allowed improving the safety of unmanned aerial vehicles flying at transport infrastructure facilities and creating prerequisites for cancelling existing restrictions on the use of unmanned aerial vehicles at transport facilities (Svetlana Shvetsova, Alexey Shvetsov, 2021).Public transport is an important element of the infrastructure of modern cities and other settlements, improving the level of public transport safety is an important task. The main causes of accidents in transport were studied, the experience of developing various transport safety systems was analyzed, and digital technologies and tools that would improve the level of safety were identified. And a suggested model for reference and managing the public transport infrastructure system based on digital technologies was developed (Daniil Bolobonov, Alexander Frolov, Alexandra Borremans et al., 2021).Gideon Ndubuisi, ChuksOtioma, GodswayKorku Tetteh (2021) found that "Digital infrastructure contributes positively to services sector employment. However, further analyses reveal that the positive effect of digital infrastructure on services sector employment depends on education, institutional quality, and macroeconomic conditions as captured by the inflation rate. In particular, they find that the positive effect of digital infrastructure on services sector employment increases as institutional quality becomes better, while poor macroeconomic conditions decrease the effect of digital infrastructure on employment in services. They also find evidence suggesting that the effect of digital infrastructure on employment in the services sector tends to benefit countries at low levels of education".

III. Methodology  
3.1. Study Framework.



### 3.2. Variables of study model.

**Independent variables:** Information technology Infrastructure (ITI) included:

ITI<sub>1</sub> is number of safe Internet connections. The unit is the number of transmission lines.

ITI<sub>2</sub> is number of ADSL internet subscribers. Unit is the number of subscribers.

ITI<sub>3</sub> is number of broadband subscriptions. Unit is the number of subscribers.

ITI<sub>4</sub> is international internet traffic. Unit is KB/sec per use.

ITI<sub>5</sub> is number of fixed telephone registration. Unit is the number of subscribers.

ITI<sub>6</sub> is number of mobile network subscriptions. Unit is the number of subscribers.

**Dependent variables:**

Labour goods productivity (LGP):

$$LGP = \frac{\text{Total volume of goods have been transported}}{\text{Total number of human resource}}$$

Labour passenger productivity (LPP):

$$LPP = \frac{\text{Total number of passenger have been transported}}{\text{Total number of human resource}}$$

Capital goods productivity (CGP):

$$CGP = \frac{\text{Total volume of goods have been transported}}{\text{Total capital}}$$

Capital passenger productivity (CPP):

$$CPP = \frac{\text{Total number of passenger have been transported}}{\text{Total capital}}$$

Gross domestic products (X):

According to HCM statistics department defines GDP is "X the GDP of HCM transport logistics industry, representing the total product of the HCM transport logistics industry, which is the end result of production and business activities carried out by production and business units residing in Ho Chi Minh City, Vietnam. X is calculated according to the manufacturing method. Accordingly, X is equal to the total value added at the base price of all economic activity plus product taxes minus product subsidies".

### 3.3. Multivariate regression model.

[1] MR model for relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and LGP (MR Model: ITI and LGP):

$$LGP = y_0 + y_1ITI_1 + y_2ITI_2 + y_3ITI_3 + y_4ITI_4 + y_5ITI_5 + y_6ITI_6 + w$$

[2] MR model for relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and LPP (MR Model: ITI and LPP):

$$LPP = y_0 + y_1ITI_1 + y_2ITI_2 + y_3ITI_3 + y_4ITI_4 + y_5ITI_5 + y_6ITI_6 + w$$

[3] MR model for relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and CGP (MR Model: ITI and CGP):

$$CGP = y_0 + y_1ITI_1 + y_2ITI_2 + y_3ITI_3 + y_4ITI_4 + y_5ITI_5 + y_6ITI_6 + w$$

[4] MR model for relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and CPP (MR Model: ITI and CPP):

$$CPP = y_0 + y_1ITI_1 + y_2ITI_2 + y_3ITI_3 + y_4ITI_4 + y_5ITI_5 + y_6ITI_6 + w$$

[5] MR model for relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and X (MR Model: ITI and X):

$$X = y_0 + y_1ITI_1 + y_2ITI_2 + y_3ITI_3 + y_4ITI_4 + y_5ITI_5 + y_6ITI_6 + w$$

Where

y<sub>0</sub> is the intersection point of vertical axis and lines of regression.

w is other factors which are not ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> that this paper does not have analysis.

According to Keshab Bhattarai (2015, p. 55) and Jeffrey M. Wooldridge (2020, p. 126). Null Hypotheses and Alternative Hypotheses of Multivariate regression model are below:

y<sub>0</sub> + y<sub>1</sub> + y<sub>2</sub> + y<sub>3</sub> + y<sub>4</sub> + y<sub>5</sub> + y<sub>6</sub> = 0 is to mean that the MR model is built not suitably to the input data and it does not have statistics significance.

y<sub>0</sub> + y<sub>1</sub> + y<sub>2</sub> + y<sub>3</sub> + y<sub>4</sub> + y<sub>5</sub> + y<sub>6</sub> ≠ 0 is to mean that the MR model is built suitably to the input data and it has statistics significance.

y<sub>0</sub> + y<sub>1</sub> + y<sub>2</sub> + y<sub>3</sub> + y<sub>4</sub> + y<sub>5</sub> + y<sub>6</sub> > 0 that is to mean ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> impact on LGP, LPP, CGP, CPP and X, respectively and separately.

y<sub>0</sub> + y<sub>1</sub> + y<sub>2</sub> + y<sub>3</sub> + y<sub>4</sub> + y<sub>5</sub> + y<sub>6</sub> < 0 that is to mean ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> do not impact on LGP, LPP, CGP, CPP and X, respectively and separately.

#### **IV. Information technology Infrastructure**

Information technology supporting to logistics transport infrastructure to have positive impact on the economy (Vladislav Uskov, Oleg Kharchenko, 2021).

Girijasankar Mallik, Tapan P. Bagchi (2018) stated that "Embellishment of information and communication technology infrastructure – an apparent imperative in an economy's information technology policy formulation – for both fixed broadband and internet users causes a boost in the per capita GDP".

The growing demand for adaptive and efficient Wi-Fi offloading technology, which requires improvement of existing algorithms. It has been becoming more and more important. Wi-Fi – LTE is considered as solution for vehicle communications infrastructure. That is necessary in order to continue to develop economically justified and beneficial solutions for future transport infrastructure networks (ArnisAncans, Ernests Petersons, GuntisAncans et al., 2019).

#### **V. Data source**

Data of HCM logistics transport productivity and GDP are from HCM Statistics Department and HCM Statistical Yearbook.

Data of information technology infrastructure are from World Bank.

4. Study results.

**Table 1: Results of MR models for relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and LGP ([1] MR Model: ITI and LGP), between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and LPP ([2] MR Model: ITI and LPP) and between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and CGP ([3] MR Model: ITI and CGP):**

[1] MR Model: ITI and LGP				[2] MR Model: ITI and LPP				[3] MR Model: ITI and CGP			
R square (RS)		0.83725819 (84%)		R square (RS)		0.84114766 (84%)		R square (RS)		0.69292751 (69%)	
Adjusted R Square (ARS)		0.59314549 (59%)		Adjusted R Square (ARS)		0.60286916 (60%)		Adjusted R Square (ARS)		0.23231876 (23%)	
Significance F (SF)		0.12653212		Significance F (SF)		0.12124674		Significance F (SF)		0.36079534	
Independent variables	Coefficients	Value of Coefficients (VC)	P-Value (PV)	Independent variables	Coefficients	Value of Coefficients (VC)	P-Value (PV)	Independent variables	Coefficients	Value of Coefficients (VC)	P-Value (PV)
	y <sub>0</sub>	1.02621126	0.36707435		y <sub>0</sub>	0.10167122	0.44264007		y <sub>0</sub>	1.5856018	0.22450575
ITI <sub>1</sub>	y <sub>1</sub>	-4.968E-06	0.4790375	ITI <sub>1</sub>	y <sub>1</sub>	1.356E-07	0.86592943	ITI <sub>1</sub>	y <sub>1</sub>	3.9781E-06	0.59859231
ITI <sub>2</sub>	y <sub>2</sub>	-0.0338228	0.89539716	ITI <sub>2</sub>	y <sub>2</sub>	-0.0293811	0.36179467	ITI <sub>2</sub>	y <sub>2</sub>	0.15050028	0.59931806
ITI <sub>3</sub>	y <sub>3</sub>	3.3861E-05	0.8952705	ITI <sub>3</sub>	y <sub>3</sub>	2.9382E-05	0.36174189	ITI <sub>3</sub>	y <sub>3</sub>	-0.0001505	0.59937631
ITI <sub>4</sub>	y <sub>4</sub>	0.00790805	0.51541612	ITI <sub>4</sub>	y <sub>4</sub>	-7.565E-05	0.95679716	ITI <sub>4</sub>	y <sub>4</sub>	-0.007934	0.54894062
ITI <sub>5</sub>	y <sub>5</sub>	-2.618E-09	0.92695693	ITI <sub>5</sub>	y <sub>5</sub>	-1.238E-09	0.71629817	ITI <sub>5</sub>	y <sub>5</sub>	-6.448E-09	0.8368313
ITI <sub>6</sub>	y <sub>6</sub>	-6.209E-09	0.30722486	ITI <sub>6</sub>	y <sub>6</sub>	-9.864E-11	0.88280918	ITI <sub>6</sub>	y <sub>6</sub>	-9.393E-09	0.18111694

Table 1 shows the results of [1] MR Model: ITI and LGP, [2] MR Model: ITI and LPP and [3] MR Model: ITI and CGP.

[1] MR Model: ITI and LGP:

RS = 0.83725819 (84%), ARS = 0.59314549 (59%) is to mean the output result is explained 59% of input data by regression.  $y_0 + y_1 + y_2 + y_3 + y_4 + y_5 + y_6 = 1.000325375 \neq 0$ , that means the MR model is built suitably to the input data and it has statistics significance at the level is 0.12653212.

Independent variables have VC > 0 that impact on LGP consist of  $y_3 = 3.3861\text{E-}05$ ,  $y_4 = 0.00790805$ .

Independent variables have VC < 0 that do not impact on LGP consist of  $y_1 = -4.968\text{E-}06$ ,  $y_2 = 0.0338228$ ,  $y_5 = -2.618\text{E-}09$ ,  $y_6 = -6.209\text{E-}09$ .

[2] MR Model: ITI and LPP:

RS = 0.84114766 (84%), ARS = 0.60286916 (60%) is to mean the output result is explained 60% of input data by regression.  $y_0 + y_1 + y_2 + y_3 + y_4 + y_5 + y_6 = 0.072243945 \neq 0$ , that means the MR model is built suitably to the input data and it has statistics significance at the level is 0.12124674.

Independent variables have VC > 0 that impact on LPP consist of  $y_1 = 1.356\text{E-}07$ ,  $y_3 = 2.9382\text{E-}05$ .

Independent variables have VC < 0 that do not impact on LPP consist of  $y_2 = -0.0293811$ ,  $y_4 = -7.565\text{E-}05$ ,  $y_5 = -1.238\text{E-}09$ ,  $y_6 = -9.864\text{E-}11$ .

[3] MR Model: ITI and CGP:

RS = 0.69292751 (69%), ARS = 0.23231876 (23%) is to mean the output result is explained 23% of input data by regression.  $y_0 + y_1 + y_2 + y_3 + y_4 + y_5 + y_6 = 1.728021554 \neq 0$ , that means the MR model is built suitably to the input data and it has statistics significance at the level is 0.36079534.

Independent variables have VC > 0 that impact on CGP consist of  $y_1 = 3.9781\text{E-}06$ ,  $y_2 = 0.15050028$ .

Independent variables have VC < 0 that do not impact on CGP consist of  $y_3 = -0.0001505$ ,  $y_4 = -0.007934$ ,  $y_5 = -6.448\text{E-}09$ ,  $y_6 = -9.393\text{E-}09$ .



**Table 2: Results of MR model for relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and CPP ([4] MR Model: ITI and CPP) and between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and X ([5] MR Model: ITI and X).**

[4] MR Model: ITI and CPP				[5] MR Model: ITI and X			
R square (RS)		0.53106846 (53%)		R square (RS)		0.99792535 (99.7%)	
Adjusted R Square (ARS)		-0.1723289 (-17%)		Adjusted R Square (ARS)		0.99481338 (99%)	
Significance F (SF)		0.63951222		Significance F (SF)		0.00002575	
Independent variables	Coefficients	Value of Coefficients (VC)	P-Value (PV)	Independent variables	Coefficients	Value of Coefficients (VC)	P-Value (PV)
	y <sub>0</sub>	0.1964028	0.23521185		y <sub>0</sub>	-3529.0553	0.89702987
ITI <sub>1</sub>	y <sub>1</sub>	1.3292E-06	0.20853768	ITI <sub>1</sub>	y <sub>1</sub>	-0.1850254	0.31580528
ITI <sub>2</sub>	y <sub>2</sub>	0.00749795	0.8345553	ITI <sub>2</sub>	y <sub>2</sub>	6463.96733	0.3506128
ITI <sub>3</sub>	y <sub>3</sub>	-7.497E-06	0.83456386	ITI <sub>3</sub>	y <sub>3</sub>	-6.4542614	0.35121742
ITI <sub>4</sub>	y <sub>4</sub>	-0.0022316	0.22228339	ITI <sub>4</sub>	y <sub>4</sub>	139.792303	0.64527776
ITI <sub>5</sub>	y <sub>5</sub>	-2.012E-09	0.61886951	ITI <sub>5</sub>	y <sub>5</sub>	-0.0006662	0.38278681
ITI <sub>6</sub>	y <sub>6</sub>	-6.683E-10	0.41736892	ITI <sub>6</sub>	y <sub>6</sub>	0.00013644	0.36813586

[4] MR Model: ITI and CPP:

RS = 0.53106846 (53%), ARS = -0.1723289 (-17%) is to mean the output result has not been able to be explained by input data by regression, so the MR model is built not suitably to the input data and it has no statistics significance.

[5] MR Model: ITI and X:

RS = 0.99792535 (99.7%), ARS = 0.99481338 (99%) is to mean the output result is explained 23% of input data by regression.  $y_0 + y_1 + y_2 + y_3 + y_4 + y_5 + y_6 = 3068.064552 \neq 0$ , that means the MR model is built suitably to the input data and it has statistics significance at the level is 0.00002575.

Independent variables have VC > 0 that impact on X consist of  $y_2 = 6463.96733$ ,  $y_4 = 139.792303$ ,  $y_6 = 0.00013644$ .

Independent variables have VC < 0 that do not impact on X consist of  $y_1 = -0.1850254$ ,  $y_3 = -6.4542614$ ,  $y_5 = -0.0006662$ .

## VI. Discussion

Based on study results are presented in table 1 and table 2 of section 6 that:

Relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and LGP is explained by MR model at 59% input data. There are two independent variables impact on LGP consist of ITI<sub>3</sub> ( $y_3 = 3.3861E-05$ ) and ITI<sub>4</sub> ( $y_4 = 0.00790805$ ). Relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and LPP is explained by MR at 60% input data. There are two independent variables impact on LPP consist of ITI<sub>1</sub> ( $y_1 = 1.356E-07$ ) and ITI<sub>3</sub> ( $y_3 = 2.9382E-05$ ). Relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and CGP explained by MR model at 23% input data. There are two independent variables impact on CGP consist of ITI<sub>1</sub> ( $y_1 = 3.9781E-06$ ) and ITI<sub>2</sub> ( $y_2 = 0.15050028$ ). Relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and CPP has not been able to be explained by input data by regression, so the MR model is built not suitably to the input data and it has no statistics significance. Relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and X is explained by MR model at 99% input data. There are three independent variables impact on X consist of ITI<sub>2</sub> ( $y_2 = 6463.96733$ ), ITI<sub>4</sub> ( $y_4 = 139.792303$ ) and ITI<sub>6</sub> ( $y_6 = 0.00013644$ ).

## VII. Conclusion

According to study results are shown in table 1 and table 2 of section 6 and discussion in section 7, we have conclusion is Labour goods productivity (LGP) is impacted by (ITI<sub>3</sub>) number of broadband subscriptions and (ITI<sub>4</sub>) international internet traffic. Labour passenger productivity (LPP) is impacted by (ITI<sub>1</sub>) number of safe Internet connections and (ITI<sub>3</sub>) number of broadband subscriptions. Capital goods productivity (CGP) is impacted by (ITI<sub>1</sub>) number of safe Internet connections and (ITI<sub>2</sub>) number of ADSL internet subscribers. Gross domestic product (X) is impacted by (ITI<sub>2</sub>) number of ADSL internet subscribers, (ITI<sub>4</sub>) international internet traffic and (ITI<sub>6</sub>) number of mobile network subscriptions. The relation between ITI<sub>1</sub>, ITI<sub>2</sub>, ITI<sub>3</sub>, ITI<sub>4</sub>, ITI<sub>5</sub>, ITI<sub>6</sub> and CPP has not been able to be explained by input data by regression, so the MR model is built not suitably to the input data and it has no statistics significance.

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