

A Panel Data Model on e-Business Development of Nations

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ABSTRACT

e-Business development has become a key factor for the sustainable economic growth and development of any nation in this new era of digital revolution. This is a macro level study based on the hypothesis that the e-business development of a nation can be predicted on the basis of four independent estimators, namely, 1) Country Characteristics; 2) Business Sophistication; 3) Technological Readiness; and 4) e-Government Support. A panel data of five years (2012-2016) relating to 132 world countries were collected and analyzed. The objective of the study is to develop a panel data regression model (fixed effect) which could test the theoretical foundation that e-business development of a nation could be predicted by the above four estimators. Suitable measurement indicators are collected from reliable sources like IBRD, IMF, WEF, UNCTAD, UN e-Government Report and the Transparency International for the measurement of the variables in the study. The overall functional relationship of the model is proved statistically significant on obtaining a significant F-value at <1% level and also with a high R-square value. All the coefficients are positive and significant at 1% level and hence it is proved that country characteristics, business sophistication, technological readiness, and e-government support have strong positive association to the e-business development of a nation. The growth of e-business, of course, leads to a raise in investment in Information Communication Technology (ICT) which turned out to a raise in productivity and economic growth of a nation. In conclusion, e-Business development of a nation shall be explained as ‘the formation of a culture of innovation, sophistication, discipline, adaptation, and transformation of businesses and society at large’.

Keywords: e-Business, Innovation, Sophistication, Transformation, Panel-data.

1. INTRODUCTION

The impact of the electronic business (e-business) upon companies and upon society has great relevance both as to its extent and intensity. For companies, e-business offers unique opportunities of reorganizing the businesses, redefining the markets or creation of new markets. The initiatives of e-business can decrease the costs, increase the earnings and operational efficiency in the present day competitive economic environment. The impact of e-business upon society is mainly: “reduction of transaction costs, improvement of access to market information, intensification of competition, better resource allocation, and improvement of the companies’ competitiveness and enhance, on this base, their ability of creating value and of competing on more globalized markets” (Ghibutiu, 2003, p.169.). Although primarily an economic phenomenon, e-business forms part of a broader process of social change, characterized by the globalization of markets, the shift towards an economy based on knowledge and information, and the growing prominence of all forms of technology in everyday life. These major societal transformations are now under way and will probably continue far into the foreseeable future. As both a product and manifestation of such transformations, e-commerce is being shaped by, and increasingly will help to shape, modern society as a whole (OECD, 1999). As a result e-business has become an opportunity to increase competitiveness both on a micro and macroeconomic level.

1.1 Background of the study:

e-Business is the concept of conducting trade and retail business online through the use of secure websites. It constitutes the exchange of products and services between business, groups and individuals. The growth of e-business leads to raise in the investment of Information Communication Technology (ICT) which in turn leads to raise the productivity and economic growth. New growth theories support the view that the key driver for economic growth in global economies is innovation (Griffith et.al. 2004). It is something that reduces cost and increases quality (Shih. 2012). There are three important factors underpinning economic growth according to modern economists: 1. Capital accumulation, including all new investments in land, physical equipment, and human resources, 2. Growth in population and hence eventual growth in the labor force, and 3. Technological progress.

e-Business has changed the old economy relationship (known as vertical) where producers have no direct contact with the consumers, rather, they are interlinked by wholesalers and retailers. The new economy relation is called integrated or extended relationship where the producers and consumers have direct relations, the retailers and producers are directly linked and all these made possible through e-business. Building a business into a successful e-business has become an important objective for today's enterprises. It requires such business capabilities as global networking, process integration, information sharing, supply-chain agility, and intelligent decision making. The integration of traditional as well as web-oriented functions is the cornerstone of successful e-business. What makes information systems the backbone of business operations is the emerging global information infrastructure. Enterprises can achieve business integration and coordination through this infrastructure. This is the foundation of any e-business.

The evolution of e-business during the past few years is a result of the transition from private or closed network system to an open, public network platform, such as the Internet and Mobile networks. This facilitates improvement in operations leading to substantial cost savings as well as increasing competitiveness and efficiency through the redesigning of traditional business. What is required for developing countries is that they would require implementing national e-strategies, according to the standards set by internationally agreed principles for information society, for their own needs. Here the major challenge would be to bring national e-strategies into the overall development of a nation (Basu, 2004). It has been observed that firms adopting ICT require well-qualified and trained staff, capable of responding to the demands of flexibility and adaptation to new technologies, and to the new environments in which they are implemented, in order to achieve higher levels of productivity and efficiency (Galve-Górriz, 2010).

An empirical analysis on the determinants of e-business activity across countries revealed that a country's e-business activity depends not only on ICT infrastructure but also on human capital and logistics infrastructure (Gregorio, et.al. 2005). The macro economic impact of e-business is not only on the increase productivity, reduce cost and enhance competition for a national economy but it will continue to stimulate aggregate economic activities across the world (Heil and Prieger, 2009). Results of one study show that e-government and e-business are closely related and intertwined with each other. The cross-country analysis further says that the impact of e-government on national economic performance is effectively realized through the development of e-business in that nation (Srivastava and Thompson, 2010).

The McKinsey Global Institute (2011) found that the internet access has helped small and medium enterprises (SMEs) in eight developing countries to create 3.2 jobs for every job lost (Rillo and Cruz, 2016). So e-business could create job opportunities and improve productivity of SMEs which is a major sector in developing economies. The famous organizational consultant Warren Bennis once observed that 'factory of the future will have only two employees, a man and a dog. The man will be there to feed the dog, the dog will be there to keep the man from touching the equipment' (Friedman, 2016, p.195). Though it seems to be

an exaggerated statement of modernization, yet it indicates the accelerated rate of technological changes and innovation among business enterprises globally.

2. RESEARCH DESIGN:

2.1 Statement of Problem:

The United Nations Conference on Trade and Development (UNCTAD) estimated that global e-commerce sales comprising business-to-business (B2B) and business-to-consumer (B2C) transactions amounted to \$16.1 trillion in 2013. Many factors contributed to e-commerce growth such as changes in information technology and connectivity, sophisticated changes in business models, and a supportive regulatory and legal environment in many countries. Although the bulk of e-commerce transactions occur in developed markets, yet developing countries have started to catch up recently. For example, the People's Republic of China (PRC) now has the largest B2C market in the world, surpassing the United States. The Asian countries like Indonesia and India are also expected to show the fastest growth in this market segment. As a result, the combined share of Asia (and Oceania) in the world's B2C market is projected to further increase to 37% in 2018 from 28% in 2013 (UNCTAD, Information Economy Report ,2015).

On a preliminary examination of the above reports, it has been observed that e-business growth is high in some of the world countries, and some others fall far behind the curve. The factors contributed for e-business development of world countries are common but they are found to be different from conventional economic growth factors. The researcher has identified that e-business development depends on a country's particular characteristics, business sophistication ability, technological readiness, and e-government support. The study examines the relationship of these factors for the development of e-business among world nations. Do these factors have a strong influence in world economies for their e-business growth and development? There seems to be significant difference between high income and lower-middle income or low-income countries. Is this statistically significant among these different income levels of economies? These are the challenging questions pondered in this research study.

2.2 Objectives of the Study: The study is designed with the following specific objectives.

1. To determine whether the country specific characteristics measured by economic growth rate, human capital index, and corruption perception index have influence on e-business development of a country.
2. To determine whether the business sophistication has influence on e-business development of a nation.
3. To determine whether the technological readiness of a country has influence on its e-business development.
4. To determine whether the e-government support is a factor influencing e-business development of a nation.
5. To examine whether the low-income and lower-middle income economies in Asia and Africa have low rate of e-business development due to the slow growth of the above four indicators of e-business development.

2.3 Hypotheses:

e-Business development of a nation is an integrated process by the interplay of a number of factors which the researcher mainly identified as the Country characteristics, Business sophistication, Technological readiness, and e-government support.

The country characteristics could be measured by many variables and for the purpose of the study, it's limited to 3 variables, namely, economic growth rate, human capital index, and corruption rate of the country. Of course, being a developmental activity it requires investment which could be measured by the level in productive investment and measured through the economic growth rate (GDP growth). Along with material development, human capital development is important for e-business development, and hence it is measured by human capital index. Also transparency and credibility of the dealings are important to ensure the trustworthiness of transactions and hence the Corruption Perception Index of nation is considered. Hence, the first hypothesis is formulated as,

H₁: e-business development of a nation is associated with the country characteristics such as human capital index, economic growth rate, and corruption.

Businesses shall be converted to e-businesses only through the process of sophistication of the existing businesses. It mainly requires a vertical and horizontal integration of the business processes. Also, the quantity and quality of the existing local businesses is a major factor of sophistication and how they operate at national level and international to acquire a unique identity for their products and processes. Hence, the second hypothesis is formulated as,

H₂: e-business development of a nation is associated with the business sophistication of that nation.

Technological induction is indispensable for e-business development. The technological readiness is an indicator of e-business development. The main indication of technological readiness is the wide-spread use of internet and mobile; as well as the bandwidth of data transfer. Developed countries are willing to invest in less developed countries but for e-business development along with FDI, the technology transfer is required to make the less developed to be prosperous on e-business. All these factors are counted and measured and hence the third hypothesis is formulated as,

H₃: e-business development of a nation is associated with the technological readiness of that nation.

The support of the government of a nation has been a key factor of e-business development and it is measured by the indicator e-government support. How much effort is imparted by the government to make its citizens as netizens has been measured by this variable. The government's investment in telecommunication infrastructure, the quality of online services etc. are taken as key for e-business development. Hence, the fourth hypothesis is formulated as,

H₄: e-business development of a nation is associated with the e-government support of that nation.

2.4 Sample Design: The population in this study includes all the sovereign independent nations (193 as of 2017) as per the current membership list in the United Nations General Assembly and the unit of analysis is each individual nation. Based on the data availability 132 nations are included in this study which comes to be 68 percent of the total population. Region-wise, there are 37 nations from Europe, 36 from Asia and Oceania, 34 from Africa, and 25 from America. Based on Income-wise classification, 47 nations belong to High-income, 34 nations each in Upper middle-income and Lower middle-income, and 17 nations in Low-income category. (Refer Table1; Annexures 2 & 3).

3. DATA ANALYSIS:

3.1 Data Collection: Secondary data are collected from various sources for the study. Six different database are used in this study. They are; 1) the United Nations e-Government Survey Reports; 2) Global Competitiveness Reports and Global Information Technology

Reports of the World Economic Forum (WEF); 3) World Bank; 4) International Monetary Fund; 5) United Nations Conference on Trade and Development (UNCTAD); and 6) Transparency. International (TI). All the datasets used in this study are considered reliable and they have been extensively used in academic research. A five year time series (2012-2016) data have been collected for the study. Therefore it is a panel data which constitute a combination of cross-sectional data of 132 countries for 5 years making a total number of 660 observations. All the above agencies have followed consistent methods for data collection, analysis and interpretation of results. Hence, it is considered that the data are valid for the present study. The World Bank classification of countries on the basis of income in 2016 has also been taken for the analysis. Accordingly, countries are classified into four, namely, High income countries, Upper middle income countries, Lower middle income countries, and Low income countries. A summary of this distribution is given in Table 1.

Table 1- Region vs. Income classification of countries

Region/ Income	High income	Upper-middle income	Lower-middle income	Low income	Total
Europe	28 (59%)	8 (24%)	2 (6%)	0 (0%)	38 (29%)
Africa	1 (2%)	5 (14%)	13 (38%)	15 (88%)	34 (26%)
America	6 (13%)	13 (38%)	5 (15%)	1 (6%)	25 (19%)
Asia & Oceania	12 (26%)	8 (24%)	14 (41%)	1 (6%)	35 (26%)
Total	47 (100)	34 (100)	34 (100)	17 (100)	132 (100)

Source: www.worldbank.org

The high income countries constitute 35%, upper middle income and lower middle income 26% each and low income countries 13% of the total 132 countries. Moreover, 88% of the low income countries are from Africa and 57% of the high income countries are from Europe. Therefore a high income disparity can be seen among the Regions under study.

3.2 Variables and measurement indicators: The study is conducted by collecting data on 4 independent variables which are hypothetically proposed as the cause for e-business development of a country, the dependent variable. The independent variables are defined in the following terms: 1. Country characteristics index; 2. Business sophistication index; 3. Technological readiness index; and 4. E-Government support index. The variables are measured by using the most suitable indicators relating to them. A summary of these indicators and their details are given in Table 2. (Refer Annexure 1 for definitions)

Table 2- Variables and Measurement Indicators

Variables	Code	Measurement Indicators	Value	Source
IDV 1. Country characteristics index	cci	1. Human Capital Index	0-1(best)	UNEGR
		2. Economic growth rate.	Percent	WB/IMF
		3. Corruption Perception Index	0-100(v. clean)	TI
IDV 2. Business sophistication index	bsi	4. 11 th pillar of Global Comp. Index	1-7 (best)	WEF
IDV 3. Technological readiness index	tri	5. 9 th pillar of Global Comp. Index	1-7 (best)	WEF
IDV 4. e-government support index	egsi	6. e-government Development Index	0-1(best)	UNEGR
		7. e-participation Index	0-1(best)	UNEGR
DV: e-business	ebdi	8. B2C e-commerce Index	1-100(best)	UNCTAD

development index	9. e-business usage- 7 th pillar of Global Information Technology Index	1-7(best)	WEF
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Source: Developed by Researcher (Refer Annexures 4 -8 for components of measurement indicators)

3.3 Proposed Panel Data Model: Panel data are more informative, shows more variability in the data, less collinearity among the variables, more degrees of freedom, and more efficiency (Baltagi, 2013). The Hausman specification test (Hausman, 1978) compares a random effect model to its fixed counterpart. If the null hypothesis that the individual effects are uncorrelated with the other regressors is not rejected, a random effect model is favored over its fixed counterpart. The formula of Hausman test examines if “the random effects estimate is insignificantly different from the unbiased fixed effect estimate” (Kennedy, 2008: 286). If the null hypothesis of no correlation is rejected, it can be concluded that individual effects u_i are significantly correlated with at least one regressors in the model and thus the random effect model is problematic. Therefore, it is required to go for a fixed effect model rather than the random effect counterpart. (Refer Annexure 9 for the Hausman test results). Here, the Null Hypothesis is rejected as per Hausman test results and hence the fixed effect model is adopted for analysis. A one way fixed effect model is used in analysis considering the individual group effect of the data. The functional form of one-way fixed effect model is:

$$Y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + u_i + v_{it}$$

Where,

Y_{it} = estimated value of DV ebdi of country ‘i’ at time ‘t’;

α = constant (y-intercept);

$\beta_1, \beta_2, \beta_3,$ and β_4 = standardized coefficient of IDV1, IDV 2, IDV 3, and IDV 4 respectively;

$X_{1it}, X_{2it}, X_{3it},$ and X_{4it} = IDV1 cci of country ‘i’ at time ‘t’, IDV2 bsi of country ‘i’ at time ‘t’, IDV3 tri of country ‘i’ at time ‘t’, and IDV4 egisi of country ‘i’ at time ‘t’ respectively;

u_i = fixed effect specific to the individual group; and

v_{it} = standard error.

Since an individual specific effect is time invariant and considered a part of the intercept, u_i is allowed to be correlated with other regressors.

3.4 Descriptive statistics and Regression Results: All the variables are converted to their natural logarithm (LN) in order to bring normality in the data as well as to have a uniformity for the different scales of measurement used for the variables at the sources. Table 3 gives the summary statistics of the variables used for regression analysis.

Table 3- Summary Statistics of Variables

Variables	Mean	Std. Dev.	CV	Minimum	Maximum	N
LN of ebdi	4.8488	1.1805	24.35	0.0953	6.2818	660
LN of cci	4.3247	0.9136	21.13	-0.9518	7.5473	660
LN of bsi	1.3874	0.1722	12.41	0.9314	1.7614	660
LN of tri	1.3460	0.2848	21.16	0.0000	1.8593	660
LN of egisi	-1.8391	1.2319	-66.99	-5.8531	-0.0553	660

Source: Developed by Researcher

All the variables have the same number of observations and hence the 132 panels in the data are strongly balanced and no missing values in the data. The coefficient of variation (CV) is very high in the case of ‘e-government support index’ (66.99) which implies that the e-government support of nations is highly inconsistent across the world. The CV of independent variables, ‘country characteristics index’ (21.13) and that of ‘technological readiness index’ (21.16) are almost equal and hence they have a moderate level of variation among the nations. The ‘business sophistication index’ has got the lowest level of CV (12.41) and therefore it is implied that there is a lower level of variation on this factor among nations. The coefficient of variation of the dependent variable, ‘e-business development index’ is

24.35 and the minimum and maximum values are 0.0953 and 6.2818 respectively, implies that there is a significant difference in e-business development among nations across the world.

Table 4 – Regression Results -Fixed one way estimates - Overall

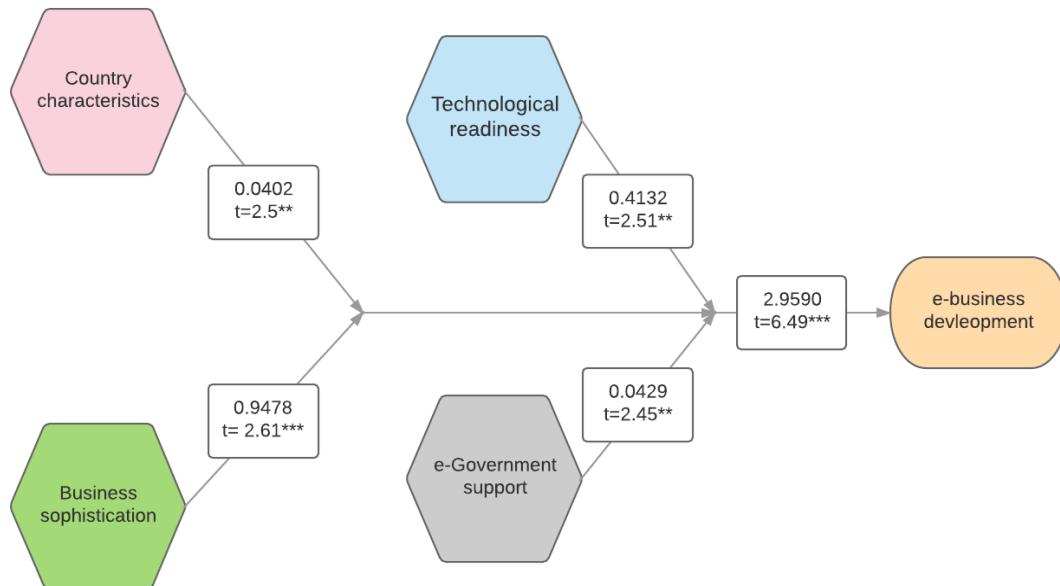
e-business development index	Coefficient	Std. Er	t-value	P > t
Country characteristics index	0.0402	0.0161	2.50	0.0127
Business sophistication index	0.9478	0.3629	2.61	0.0093
Technological readiness index	0.4132	0.1644	2.51	0.0123
e-government support index	0.0429	0.0175	2.45	0.0145

Number of cross sections	132
Time series length	5
Number of observations	660
F (131, 524)	48.05
Prob > F	< .0001
R – square	0.9618
Root MSE	0.2587

Source: Developed by Researcher

Refer Annexure 10 for country specific estimate (u_i).

The panel data regression results given in Table 4 is the overall analysis of the data which has proved that the F-value is statistically significant ($p < .0001$), and hence the effect on dependent variable by the four independent variables could be explained and states that all the coefficients in the model are different than zero. The R-square value is very high and hence the independent variables could explain 96.18 percent of the variation in the dependent variable. All the coefficients are positive and therefore it is proved that they have direct relation with the dependent variable ‘e-business development’ as stated in previous studies.



** < .01, *** < .001

Figure 1: Conceptual Framework and Parameters

The coefficients of Country characteristics index, Technological readiness index and e-government support index are significant at 1percent level and that of Business sophistication and Y-intercept (constant) are significant at less than 1percent. Hence, the overall structure of

the model is proved as empirically valid and so it is applicable to all world nations. Therefore, when there is 1 unit increase in each independent variable, namely, country characteristics index, business sophistication index, technological readiness index, and e-government support index, a corresponding increase of 0.04 unit, 0.95 unit, 0.41 unit, and 0.04 unit in e-business development of a country. The country specific intercept is significant at less than 5 percent level for 33 countries, at less than 1 percent level for 23 countries, and less than 0.01 percent for 17 countries. Therefore out of the total 132 countries 73 countries show significant individual effect on e-business development. It further supports the proposition that the fixed effect one way model is relevant and significant for the study.

Table 5 – Regression Results - Fixed one way estimates- Africa

			Number of cross sections	34
			Time series length	5
			Number of observations	170
			F (33, 132)	148.66
			Prob > F	< .0001
			R – square	0.9775
			Root MSE	0.2197
e-business development index	Coefficient	Std. Er	t-value	P > t
Country characteristics index	-0.0356	0.0331	-1.08	0.2839
Business sophistication index	0.9545	0.4402	2.17	0.0319
Technological readiness index	0.6339	0.1740	3.64	0.0004
e-government support index	0.0654	0.0241	2.72	0.0075

Source: Developed by Researcher

Refer Annexure 11 for the Country specific estimate (u_i).

Table 5 gives the regression results of the data related to 34 African countries. Out of 34 African countries 20 country specific estimates are significant at less than 1 percent level. The model is found to be significant and valid for African countries in the region-wise analysis. The F-value is significant and the also there is high R-square value. All the coefficients are significant at less than 5 percent level except the ‘country characteristics index’.

Table 6 – Regression Results - Fixed one way estimates- Asia & Oceania

			Number of cross sections	36
			Time series length	5
			Number of observations	180
			F (35, 140)	15.23
			Prob > F	< .0001
			R - square	0.9651
			Root MSE	0.1195
e-business development index	Coefficient	Std. Er	t-value	P > t
Country characteristics index	0.0259	0.0182	1.42	0.1585
Business sophistication index	1.0410	0.3781	2.75	0.0067
Technological readiness index	0.3731	0.1897	1.97	0.0512
e-government support index	-0.0058	0.0168	-0.34	0.7315

Source: Developed by Researcher

Refer Annexure 12 for the Country specific estimate (u_i).

Table 6 gives the regression results of the data related to Asia and Oceania countries. Out of 36 Asia and Oceania countries 24 country specific estimates are significant at less than 5 percent level. The model is found to be significant and valid for the 36 countries of Asia and Oceania in its region-wise analysis. The F-value is significant and there is high R-square value. The coefficients of ‘country characteristics index’, and ‘e-government support index’ are not significant at 5 percent level, but the others are significant at 5 percent level or less than that.

For the other two Regions, America and Europe, though the overall parameters are found to be significant, yet the estimates are not proved significant for the data. Therefore the results of these regions are not presented here.

Table 7 – Regression Results- Fixed one way estimates- Lower Middle Income Countries

			Number of cross sections	34
			Time series length	5
			Number of observations	170
			F (33, 132)	106.78
			Prob > F	< .0001
			R - square	0.9765
			Root MSE	0.1604
e-business development index	Coefficient	Std. Er	t-value	P > t
Country characteristics index	-0.0194	0.0265	-0.73	0.4651
Business sophistication index	1.2501	0.3378	3.70	0.0003
Technological readiness index	0.6043	0.2869	2.11	0.0370
e-government support index	0.0331	0.0196	1.69	0.0932

Source: Developed by Researcher

Refer Annexure 13 for the Country specific estimate (u_i).

Table 7 shows the regression results of data related to lower middle-income countries. Out of 34 Lower Middle Income Countries 14 country specific estimates are significant at less than 10 percent level. For the Lower Middle Income Countries the F-value is highly significant and the high R-square value shows the explanatory power of the model to this group is relevant and valid. The coefficient of ‘country characteristics index’ is not significant in this model and the ‘e-government support index’ is significant at 10 percent level and the other coefficients are significant at less than 5 percent level. Hence, the model is good for Lower middle income countries.

For the other three groups, namely, High-Income Countries and Upper Middle-Income Countries, and Low-Income Countries though the overall parameters of the model are good but the independent variables show insignificant values, and, hence those results are not presented here.

4. MAJOR FINDINGS AND DISCUSSION:

4.1 Major Findings:

1. The first alternative hypothesis (H_1), ‘e-business development of a nation is associated with the country characteristics such as human capital index, economic growth rate, and corruption’, is not rejected since the p-value is significant at less than 1 percent level. The standardized coefficient is 0.0402 with a corresponding t value of 2.51. These values indicate that the increase in human capital index, corruption perception index and GDP has influence to raise the e-business development of a nation.

2. The second alternative hypothesis (H_2), ‘e-business development of a nation is associated with the business sophistication of that nation’, is not rejected since the p-value is significant at less than 0.1 percent level. The standardized coefficient is 0.9478 with a corresponding t-value of 2.61. These values indicate that there is strong influence of ‘business sophistication’ on e-business development and every one unit increase in business sophistication index will result in an increase of 0.9478 unit in e-business development index. Hence business sophistication is a key factor for e-business development of a nation.

3. The third alternative hypothesis (H_3), ‘e-business development of a nation is associated with the technological readiness of that nation’, is not rejected since the p-value is significant at 1 percent level. The standardized coefficient is 0.4132 with a corresponding t-value of 2.51.

These values indicate that there is influence of ‘technological readiness’ on e-business development of a nation and every one unit increase in technological readiness index will result in an increase of 0.4132 unit in e-business development index. Hence, technological readiness is a key factor for e-business development of a nation.

4. The fourth alternative hypothesis (H_4), ‘e-business development of a nation is associated with the e-government support of that nation’, is not rejected since the p-value is significant at 1 percent level. The standardized coefficient is 0.0429 with a corresponding t-value of 2.45. These values indicate that there is influence of ‘e-government support’ on e-business development of a nation and every one unit increase in e-government support index will result in an increase of 0.0429 unit in e-business development index. Hence, e-government support is a key factor for e-business development of a nation.

5. The low-income and lower middle-income economies have slow growth of e-business development due to the fact that they have low values for country characteristics index, business sophistication index, technological readiness index, and e-government support index. 94 percent of low-income countries and 79 percent of lower middle-income countries belong to Africa and Asia region. The model is valid for Africa and Asia-Oceania region and the all the regression coefficients are signification at less than 5 percent level (except e-government support index, and country characteristics index). The descriptive statistics show that the mean values of the four independent variables are lowest for the low-income economies and lower middle-income economies. Considering all these factors together, leads to the finding that there is strong association between *low growth rate* in country characteristics, in business sophistication, in technological readiness, and in e-government support with *low growth rate* in e-business development of low-income and lower middle-income countries. Hence, e-business development is related to income and region of a nation.

4.2 Discussion on Country Characteristics:

The IDV 1 ‘Country Characteristics Index’ is measured by 3 indicators, namely, Human Capital Index, GDP growth rate, and Corruption Perception Index. The coefficient of IDV1 is significant at 1 percent level in the overall analysis of the data. But the descriptive statistics in Table 8 show that Low Income countries have the lowest level of human capital index and corruption perception index (highly corrupt) though they show on an average highest GDP growth rate. This indicates that e-business development of a country is closely related to human capital growth and corruption of that country rather than the GDP growth rate. The human capital growth of a country depends on the growth in adult literacy, Gross Enrollment Ratio in primary, secondary and tertiary education, and Mean Years of Schooling by the adult population. E-business development of a country is also closely related to Corruption Perception Index. It depends on the behavior of corporates and MNCs in a country for tax avoidance, secrecy in sharing the profits of companies, and unethical practices by individuals and corporates in the form of bribery and favoritism to get undue advantages. Hence, better a country in removing these evils in the society, higher would be the growth of e-business in that country. In other words, e-business cannot flourish or develop in a country where there all sorts unethical and illegal practices.

Table 8: Summary statistics of Country Characteristics

Human Capital Index:	Mean	Std. Dev	Minimum	Maximum	N
Overall	0.71	0.192	0.134	1.000	660
High Income countries	0.86	0.077	0.662	1.000	235
Upper Middle Income countries	0.76	0.074	0.555	0.913	170
Lower Middle Income countries	0.62	0.155	0.296	0.918	170
Low Income countries	0.39	0.139	0.134	0.664	85
GDP Growth Rate:					

Overall	3.51	2.464	0.006	26.276	660
High Income countries	2.48	2.220	0.006	26.276	235
Upper Middle Income countries	3.15	2.203	0.031	14.036	170
Lower Middle Income countries	4.62	2.332	0.200	12.320	170
Low Income countries	4.89	2.352	0.474	10.582	85
Corruption Perception Index:					
Overall	46.37	19.215	15	92	660
High Income countries	66.86	14.875	35	92	235
Upper Middle Income countries	38.26	9.530	17	65	170
Lower Middle Income countries	33.91	8.798	15	60	170
Low Income countries	30.82	8.682	17	54	85

Source: Developed by Researcher

4.3 Discussion on Business sophistication:

The IDV 2 ‘Business sophistication Index’ is measured by the 11th pillar of Global Competitiveness Index of the World Economic Forum. The coefficient of IDV2 is significant at 1 percent level in the overall analysis and significant at less than 0.01 percent, 1 percent, and 5 percent for lower middle income countries, Asia & Oceania, and Africa respectively. The Business sophistication index consists of 9 components. It includes the quantity and quality of local suppliers, international competitiveness of a country’s companies, the breadth of production, marketing, distribution and design chain, extent of control in the international market by a country’s companies, production is more labor or capital intensive in the companies of a country, marketing technologies adopted by a country’s companies, and extent of delegation of authority by senior management to lower levels of companies in a country. All these are measured in a 7 point scale with a positive impact on incremental values.

Table 9: Summary statistics of Business Sophistication Index

11 th Pillar of Global Competitiveness Index:					
	Mean	Std. Dev	Minimum	Maximum	N
Overall	4.06	0.7127	2.5380	5.8207	660
High Income countries	4.72	0.6161	3.4728	5.8207	235
Upper Middle Income countries	3.88	0.4443	2.5380	5.2891	170
Lower Middle Income countries	3.70	0.4143	2.5552	4.5967	170
Low Income countries	3.35	0.3550	2.6677	4.0935	85

Source: Developed by Researcher

From Table 9 it is obvious that the mean values are increasing from Low Income countries to High Income countries. Hence, the Business sophistication by the companies in a country is highly relevant and a dependent factor for the e-business development of that country. Therefore in general the businesses in the low income, the lower middle income, and the upper middle income countries have to improve a lot in business sophistication through innovative methods suitable for them to get a higher rate of growth in e-business.

4.4 Discussion on Technological readiness:

The IDV 3 ‘Technological Readiness Index’ is measured by the 9th pillar of Global Competitiveness Index of the World Economic Forum. The coefficient of IDV 3 is significant at 1 percent level in the overall analysis and significant at less than 0.01 percent, less than 5 percent, and 5 percent for African countries, for Lower Middle Income countries, and Asian countries respectively. The Technological readiness index consists of 7 components. They are measured in a 7 point scale of incremental positive value towards the indicator. The components include, the availability of latest technology in the country, firm-level technology absorption in the country, the extent of FDI and technology transfer to the country, the extent

of internet users in the country, the extent of fixed broadband internet subscriptions in the country, International internet bandwidth of the country, and the number of mobile broadband subscriptions in the country.

Table 10: Summary statistics of Technological Readiness Index

9 th Pillar of Global Competitiveness Index:					
	Mean	Std. Dev	Minimum	Maximum	N
Overall	4.00	1.1306	1.0000	6.4192	660
High Income countries	5.24	0.7380	1.0000	6.4192	235
Upper Middle Income countries	3.76	0.5038	2.4796	4.8750	170
Lower Middle Income countries	3.18	0.4139	2.3403	4.3890	170
Low Income countries	2.67	0.3123	2.0543	3.4458	85

Source: Developed by Researcher

As it is obvious from Table 10 the mean value index when compared to the High-Income countries, it is low in the case of Upper middle income countries and very low for lower middle income and low income countries. It signifies that the firms in the Asian and African countries have to increase their technological readiness in terms of the above mentioned factors. This is a key indicator for e-business development of any country.

4.5 Discussion on e-government support:

The IDV 4 ‘e-Government Support’ is measured by 2 indicators, namely, e-Government development index, and e-participation index which are computed by UN e-Government Survey. The coefficient of IDV4 is significant at 1 percent level in the overall analysis of the data and significant at less than 1 percent level for African countries, and significant at less than 10 percent for Lower Middle-Income countries.

Table 11: Summary statistics of e-Government Support

e-Government development index:					
	Mean	Std. Dev	Minimum	Maximum	N
Overall	0.5443	0.2042	0.1076	0.9462	660
High Income countries	0.7520	0.1028	0.4932	0.9462	235
Upper Middle Income countries	0.5440	0.0958	0.2999	0.7345	170
Lower Middle Income countries	0.4069	0.1121	0.1734	0.6108	170
Low Income countries	0.2452	0.0685	0.1076	0.3599	85
e-participation index:					
	Mean	Std. Dev	Minimum	Maximum	N
Overall	0.4318	0.2745	0.0263	1.0000	660
High Income countries	0.6107	0.2632	0.0263	1.0000	235
Upper Middle Income countries	0.4116	0.2348	0.0263	0.9474	170
Lower Middle Income countries	0.3200	0.2191	0.0263	0.8305	170
Low Income countries	0.2014	0.1450	0.0263	0.5932	85

Source: Developed by Researcher

E-government development index is a weighted average of normalized scores on three most important dimensions of e-government, namely, scope and quality of online services, status of the development of telecommunication infrastructure, and inherent human capital. The EGDI score ranges from 0 to 1 indicating the worst to the best. It is obvious from Table 11 that the mean score is lowest in case of Low Income countries and there is a gradual progression to this score from low income countries to high income countries and the overall mean score is higher because of the higher scores for High Income countries and Upper Middle Income countries. Therefore, a country’s national website in the native language, including the national portal, e-services portal and e-participation portal, as well as the websites of related ministries, like education, labor, social services, health, finance, and environment should have a major role in the e-business development of a country. The number of internet users, the

number of fixed telephone line subscription, the number of mobile subscribers, the number of wireless broadband subscribers, and the fixed broadband subscribers are all depends on a Government's policy and determination to facilitate and promote e-society for economic development. But the policies and determination to implement the policies by a government of a country is not enough unless the individuals are equipped with a mentality to adapt the changes. This is measured by the inherent human capital index which is measured by the education level of the society. This is very high in High Income countries and Upper middle income countries and low in Lower middle income countries and very low in Low income countries. Hence, the Governments of African and Asian countries have to formulate policies and must have stability and consistency in implementing them for growth of human capital and thereby for the development of e-business. E-participation very specifically focuses on the provisions given by a country's government to its citizens for e-information sharing, e-consultation, and e-decision making. The environment is important for the development of e-business. The support of a country's government in creating such an environment is crucial for e-business development of a country. The governments' of Low Income countries in Africa and Asia are in the increasing demand for a proactive policy for the creation of a conducive environment for e-business development.

5. SUGGESTIONS AND RECOMMENDATIONS:

1. The GDP growth rate itself does not guarantee the e-business development of a nation. In fact, low-income nations having high GDP growth rate are not reflected by a high growth in e-business development. Therefore, along with GDP growth there must be a growth for human capital. So it is right to suggest that the national governments' of Africa and Asia must frame and implement policies and invest more for qualitative and quantitative improvement in basic education, higher education and technical education of their people and it should be always student-centric. It is recommended that they must follow the best practices suitable to their country which are available elsewhere. Besides, equally important is the skill development of the people. The acquisition of skill must align with the digital technology. So skill development and technological readiness are related to each other. Therefore, it is recommended that unskilled and semi-skilled people of these nations must be continuously oriented by the concerned towards modern technology-based skills of the digital era.

2. Corruption rate is very high in low-income and lower middle-income countries which are mainly from Africa and Asia. Corruption among corporates in the form of tax evasion and hiding of beneficial owner creates black money which in turn leads to the development of a parallel economy that falls beyond the control of a government. Therefore, it is recommended that the anti-corruption laws must be extended on these matters and must be implemented effectively for the good of the nation. Similarly, bribery for a due favor or undue favor is common among these nations and the laws against these are prevailing in most of these countries but they are poor in implementation. Therefore, it is recommended to have strict implementation of anti-bribery laws where it is prevalent and enact law where it is not prevailing for the e-business development of nations.

3. Business sophistication cannot be imported to a nation unless and until there is a strong base of local businesses in quantity-wise and quality-wise. Wide vertical and horizontal integration is required for businesses in order to bring sophistication in processes and procedures. Therefore it is right to suggest to the management of business enterprises in Asia and Africa to 'think globally and act locally' in order to have business sophistication. This will strengthen the supply-chain system and would lead to the production and supply of qualitative products at competitive prices and also lead to the production and supply specialized and unique products of a country. The managements of organizations should be decentralized by delegating more power of decision making to lower levels.

4. In today's digital era, the technological readiness of a nation is measured by its bandwidth for internet and mobile connectivity. The low-income and lower middle-income countries of Asia and Africa are highly backward in this respect. So it is recommended that it should be developed within a short span of time by the initiatives of the government enterprises or private enterprises or by public-private-partnership. The Foreign Direct Investment shall be recommended to these countries only on the basis of technology transfer.

5. e-Government support is crucial for e-business development of a nation. The tele-communication infrastructure must be developed by the initiatives of the governments of countries in Asia and Africa for good e-governance. E-governance is a yardstick for e-information, e-participation, and e-decision making. It's an indicator of transparency, clarity, and reliability on official matters of a nation not only to its citizens and domestic enterprises but at an international level. Therefore, it is recommended that the Governments of low-income and lower middle-income countries should act aggressively for the promotion of e-governance of their country, if they need to have the fruits of e-business development.

6. CONCLUSION:

The development of businesses to e-businesses is indispensable to a nation and it will not happen sooner or later in every nation without deliberate and integrated efforts of the government, the managers of business enterprises and the people of that nation. The term 'global village' in modern terminology suggests the fact that anything is possible everywhere if people have the willingness, determination and the ability to do it. So in this digital era, primarily, the determination of a nation's government for modernizing its country is pivotal for e-business development. The government's role to convert its citizens to human resources is primarily depends on its concrete actions for providing quality education to the maximum extent possible. Skill development of a country should be to satisfy the local needs thinking at a global standard. In conclusion, e-Business development of a nation shall be explained as 'the formation of a culture of innovation, sophistication, discipline, adaptation, and transformation of businesses and society at large'

ANNEXURES:

Annexure 1 : Definition of Terms

Corruption: “Corruption is operationally defined as the misuse of entrusted power for private gain. Transparency International further differentiates between ‘according to rule’ corruption and ‘against the rule’ corruption. Facilitation payments, where a bribe is paid to receive preferential treatment for something that the bribe receiver is required to do by law, constitute the former. The latter, on the other hand, is a bribe paid to obtain service the bribe receiver is prohibited from providing”. (UN DPADM)

E-business: “Doing business electronically to transform key business processes. Enabling core business processes to be put online to improve services to both customers and collaborating partners, cut costs and sell products. The transformation of an organization’s processes to deliver additional customer value through the application of technologies, philosophies and computing paradigm of the new economy” (UN ESCAP).

E-governance: “The application of ICT tools in (1) the interaction between government and citizens and businesses, and (2) in internal government operations to simplify and improve democratic governance”. (UN DPADM)

E-participation: “e-participation refers both to government programs that encourage participation from the citizen and the willingness of the citizen to do so. It encompasses both the demand and the supply side. E-participation, as defined in the UN Global Reports, aims to achieve these objectives through the means of: a. Increasing e-information to citizens for decision making; b. Enhancing e-consultation for deliberative and participatory processes; and c. Supporting e-decision making by increasing the input of citizens in decision making”. (UN DPADM)

Economic Growth Rate: It is the real Gross Domestic Product (GDP) growth rate. Annual percentage change computed by World Bank and IMF. “Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources”. (World Bank)

Human Capital: “The set of skills which an employee acquires on the job, through training and experience, and which increase that employee’s value in the marketplace is human capital. Human capital refers to the properties of individuals”. (UN DPADM)

Innovation: “Innovation is a creative idea and implementation, which is different from invention. It is the act of conceiving and implementing a new way of achieving a result and/or performing work. An innovation may involve the incorporation of new elements, a new combination of existing elements or a significant change or a departure from traditional ways of doing things. It refers to new products, new policies and programs, new approaches and new processes. Public sector management of innovation may also be defined as the development of new policy designs and new standard of operating procedures by public organizations to address public policy problems. Thus, an innovation in public administration may be an effective, creative and unique answer to new problems or a new answer to old problems”. (UN DPADM)

Low Income Countries: “As of July 2016, low-income economies are defined as those with a Gross National Income (GNI) per capita, calculated using the World Bank Atlas Method, of \$ 1,025 or less in 2015”. (World Bank)

Lower Middle-Income Countries: “As of July 2016, lower middle-income economies are defined as those with a Gross National Income (GNI) per capita, calculated using the World Bank Atlas Method, between \$ 1,026 and \$ 4,035 in 2015”. (World Bank)

Upper Middle-Income Countries: “As of July 2016, upper middle-income economies are defined as those with a Gross National Income (GNI) per capita, calculated using the World Bank Atlas Method, between \$ 4,036 and \$ 12,475 in 2015”. (World Bank)

High Income Countries: “As of July 2016, high-income economies are defined as those with a Gross National Income (GNI) per capita, calculated using the World Bank Atlas Method, of \$ 12,476 or more in 2015”. (World Bank)

Annexure 2 : Region-wise list of countries

	Europe	Africa	America	Asia & Oceania
1.	Albania	1. Algeria	1. Argentina	1. Armenia
2.	Austria	2. Angola	2. Barbados	2. Azerbaijan
3.	Belgium	3. Benin	3. Bolivia	3. Bahrain
4.	Bosnia and Herzegovina	4. Botswana	4. Brazil	4. Bangladesh
5.	Bulgaria	5. Burkina Faso	5. Canada	5. Cambodia
6.	Croatia	6. Burundi	6. Chile	6. China
7.	Czech Republic	7. CÔte d'Ivoire	7. Colombia	7. Cyprus
8.	Denmark	8. Cameroon	8. Costa Rica	8. Georgia
9.	Estonia	9. Cape Verde	9. Dominican Republic	9. India
10.	Finland	10. Chad	10. Ecuador	10. Indonesia
11.	France	11. Egypt	11. El Salvador	11. Iran
12.	Germany	12. Ethiopia	12. Guatemala	12. Israel
13.	Greece	13. Gambia	13. Guyana	13. Japan
14.	Hungary	14. Ghana	14. Haiti	14. Jordan
15.	Iceland	15. Kenya	15. Honduras	15. Kazakhstan
16.	Ireland	16. Lesotho	16. Jamaica	16. Kuwait
17.	Italy	17. Madagascar	17. Mexico	17. Kyrgyzstan
18.	Latvia	18. Malawi	18. Nicaragua	18. Lebanon
19.	Lithuania	19. Mali	19. Panama	19. Malaysia
20.	Luxembourg	20. Mauritania	20. Paraguay	20. Mongolia
21.	Malta	21. Mauritius	21. Peru	21. Nepal
22.	Moldova	22. Morocco	22. Trinidad and Tobago	22. Oman
23.	Montenegro	23. Mozambique	23. United States of America	23. Pakistan
24.	Netherlands	24. Namibia	24. Uruguay	24. Philippines
25.	Norway	25. Nigeria	25. Venezuela	25. Qatar
26.	Poland	26. Rwanda		26. Republic of Korea
27.	Portugal	27. Senegal		27. Saudi Arabia
28.	Romania	28. Seychelles		28. Singapore
29.	Russian Federation	29. South Africa		29. Sri Lanka
30.	Serbia	30. Swaziland		30. Tajikistan
31.	Slovakia	31. Uganda		31. Thailand
32.	Slovenia	32. United Republic of Tanzania		32. Turkey
33.	Spain	33. Zambia		33. United Arab Emirates
34.	Sweden	34. Zimbabwe		34. Vietnam
35.	Switzerland			35. Australia
36.	Ukraine			36. New Zealand
37.	United Kingdom			

Annexure 3 : World Bank classification of countries in 2016 on the basis of INCOME

High Income	Upper middle income	Lower middle income	Low income
1. Australia	1. Albania	1. Angola	1. Benin
2. Austria	2. Algeria	2. Armenia	2. Burkina Faso
3. Bahrain	3. Argentina	3. Bangladesh	3. Burundi
4. Barbados	4. Azerbaijan	4. Bolivia	4. Chad
5. Belgium	5. Bosnia and Herzegovina	5. Cabo Verde	5. Ethiopia
6. Canada	6. Botswana	6. Cambodia	6. Gambia, The
7. Chile	7. Brazil	7. Cameroon	7. Haiti
8. Cyprus	8. Bulgaria	8. Côte d'Ivoire	8. Madagascar
9. Czech Rep.	9. China	9. Egypt	9. Malawi
10. Denmark	10. Colombia	10. El Salvador	10. Mali
11. Estonia	11. Costa Rica	11. Georgia	11. Mozambique
12. Finland	12. Croatia	12. Ghana	12. Nepal
13. France	13. Dominican Republic	13. Guatemala	13. Rwanda
14. Germany	14. Ecuador	14. Honduras	14. Senegal
15. Greece	15. Guyana	15. India	15. Tanzania
16. Hungary	16. Iran	16. Indonesia	16. Uganda
17. Iceland	17. Jamaica	17. Jordan	17. Zimbabwe
18. Ireland	18. Kazakhstan	18. Kenya	
19. Israel	19. Lebanon	19. Kyrgyz Republic	
20. Italy	20. Malaysia	20. Lesotho	
21. Japan	21. Mauritius	21. Mauritania	
22. Kuwait	22. Mexico	22. Mongolia	
23. Latvia	23. Montenegro	23. Moldova	
24. Lithuania	24. Namibia	24. Morocco	
25. Luxembourg	25. Panama	25. Nicaragua	
26. Malta	26. Paraguay	26. Nigeria	
27. Netherlands	27. Peru	27. Pakistan	
28. New Zealand	28. Romania	28. Philippines	
29. Norway	29. Russian Federation	29. Sri Lanka	
30. Oman	30. Serbia	30. Swaziland	
31. Poland	31. South Africa	31. Tajikistan	
32. Portugal	32. Thailand	32. Ukraine	
33. Qatar	33. Turkey	33. Vietnam	
34. Korea, Rep.	34. Venezuela	34. Zambia	
35. Seychelles			
36. Saudi Arabia			
37. Singapore			
38. Slovak Rep.			
39. Slovenia			
40. Spain			
41. Sweden			
42. Switzerland			
43. Trinidad and Tobago			
44. United Arab Emirates			
45. United Kingdom			
46. United States			
47. Uruguay			

Source : www.worldbank.org

Annexure 4: IDV1- Measurement Indicators

<p>1. Human Capital Index (HCI): The United Nations E-Government Survey has been compiling the HCI with the following criteria. The definitions of the four indicators of HCI are:</p> <p>A. Adult literacy is measured as the percentage of people aged 15 years and above who can, with understanding, both read and write a short simple statement on their everyday life.</p> <p>B. Gross enrolment ratio is measured as the combined primary, secondary and tertiary gross enrolment ratio, of the total number of students enrolled at the primary, secondary and tertiary level, regardless of age, as a percentage of the population of school age for that level.</p> <p>C. Expected years of schooling is the total number of years of schooling that a child of a certain age can expect to receive in the future, assuming that the probability of his or her being in school at any particular age is equal to the current enrolment ratio age .</p> <p>D. Mean years of schooling (MYS) provides the average number of years of education completed by a country's adult population (25 years and older), excluding the years spent repeating grades</p> <p>The weightage of 3:2:2:2 ratio is used for each component respectively.</p> <p>2. Economic Growth Rate: Real Gross Domestic Product (GDP) growth rate. Annual percentage change computed by World Bank and IMF. Annual percentage growth rate of GDP at market prices based on constant local currency. Aggregates are based on constant 2010 U.S. dollars. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources.</p> <p>3. Corruption Perception Index: The Corruption Perceptions Index aggregates data from a number of different sources that provide perceptions of business people and country experts of the level of corruption in the public sector. Standardize data sources to a scale of 0-100 where a 0 equals the highest level of perceived corruption and 100 equals the lowest level of perceived corruption.</p>	<p>Experts of each country are asked to assess:</p> <ol style="list-style-type: none"> a. Base erosion and profit shifting: Base Erosion and Profit Shifting (BEPS) refers to the erosion of a national tax base and one process by which this happens. This process is when multinational companies shift the profits generated in the country outside and into jurisdictions such as offshore financial centers with lower or zero tax, thus minimizing their tax burden. This practice is legal, but aside from eroding the tax base of countries where the profits have been made it also creates an unbalanced playing field, since small and medium sized businesses do not normally have access to these profit shifting schemes and therefore pay much higher taxes than multinationals. b. Beneficial ownership secrecy A beneficial owner is the real person who ultimately owns, controls or benefits from a company or trust fund and the income it generates. The term is used to contrast with the legal or nominee company owners and with trustees, all of whom might be registered the legal owners of an asset without actually possessing the right to enjoy its benefits. Complex and opaque corporate structures set up across different jurisdictions, make it easy to hide the beneficial owner, especially when nominees are used in their place and when part of the structure is incorporated in a secrecy jurisdiction. c. Bribery: The offering, promising, giving, accepting or soliciting of an advantage as an inducement for an action which is illegal, unethical or a breach of trust. Inducements can take the form of gifts, loans, fees, rewards or other advantages (taxes, services, donations, favours etc.). d. Clientelism The offering, promising, giving, accepting or soliciting of an advantage as an inducement for an action which is illegal, unethical or a breach of trust. Inducements can take the form of gifts, loans, fees, rewards or other advantages (taxes, services, donations, favours etc.).
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Sources: www.unegovernmentsurvey; www.worldbank.org; www.imf.org; www.transparency.org

Annexure 5: IDV 2 – Measurement Indicator

4. Business Sophistication Index:

The 11th pillar of Global Competitiveness Index computed by WEF is the indicator for Business sophistication index. It consists of 9 components as explained below:

- a) Local supplier quantity (In your country, how numerous are local suppliers? 1 = largely nonexistent, 7 = extremely numerous);
- b) Local supplier quality (In your country, how do you assess the quality of local suppliers? 1 = extremely poor quality; 7 = extremely high quality);
- c) State of cluster development (In your country, how widespread are well-developed and deep clusters (geographic concentrations of firms, suppliers, producers of related products and services, and specialized institutions in a particular field? 1 = nonexistent; 7 = widespread in many fields);
- d) Nature of competitive advantage (On what is the competitive advantage of your country's companies in international markets based? 1 = primarily low cost labor or natural resources; 7 = primarily unique products and processes);
- e) Value chain breadth (In your country, how broad is companies' presence in the value chain? 1 = narrow, primarily involved in individual steps of the value chain (e.g., resource extraction or production); 7 = broad, present across the entire value chain (e.g., including production, marketing, distribution, design, etc.))
- f) Control of international distribution (In your country, to what extent do domestic companies control the international distribution of their products? 1 = not at all; 7 = to a great extent)
- g) Production process sophistication (In your country, how sophisticated are production processes? 1 = not at all—production uses labor-intensive processes; 7 = highly—production uses latest technologies)
- h) Extent of marketing (In your country, how successful are companies in using marketing to differentiate their products and services? 1 = not successful at all; 7 = extremely successful)
- i) Willingness to delegate authority (In your country, how do you assess the willingness to delegate authority to subordinates? 1 = not willing at all—senior management takes all important decisions; 7 = very willing—authority is mostly delegated to business unit heads and other lower-level managers)

Source: www.weforum.org

Annexure 6: IDV 3 – Measurement Indicator

5. Technological Readiness Index:

The 9th pillar of Global Competitiveness Index computed by WEF is the indicator for Technological Readiness. It consists of 7 components as explained below:

- a) Availability of latest technologies (To what extent are the latest technologies available in your country? 1 = not available; 7 = widely available);
- b) Firm-level technology absorption (To what extent do businesses in your country absorb new technology? 1 = not at all; 7 = aggressively absorb);
- c) FDI and technology transfer (To what extent does foreign direct investment (FDI) bring new technology into your country? [1 = not at all; 7 = FDI is a key source of new technology);
- d) Internet Users (Percentage of individuals using the Internet);
- e) Broadband Internet subscriptions (Number of fixed broadband Internet subscriptions per 100 population);
- f) Internet bandwidth (International Internet bandwidth (kb/s)/capita);
- g) Mobile broadband subscriptions/100 population.

Source: www.weforum.org

Annexure 7: IDV 4 – Measurement Indicators

<p>6. E-government Development Index: The United Nations e-government development index (EGDI) is a composite indicator measuring the willingness and capacity of national administrations to use information and communication technology to deliver public services. The EGDI is a weighted average of normalized scores on the three most important dimensions of e-government, namely: scope and quality of online services (Online Service Index, OSI), status of the development of telecommunication infrastructure (Telecommunication Infrastructure Index, TII) and inherent human capital (Human Capital Index, HCI) The Telecommunication Infrastructure Index (TII) is an arithmetic average composite of five indicators: (i) estimated internet users per 100 inhabitants; (ii) number of main fixed telephone lines per 100 inhabitants; (iii) number of mobile subscribers per 100 inhabitants; (iv) number of wireless broadband subscriptions per 100 inhabitants; and (v) number of fixed broadband subscriptions per 100 inhabitants. The Human Capital Index (HCI) consists of four components, namely: (i) adult literacy rate;</p>	<p>(ii) the combined primary, secondary and tertiary gross enrolment ratio; (iii) expected years of schooling; and (iv) average years of schooling. The Online Service Index (OSI) is assessed by each country's national website in the native language, including the national portal, e-services portal and e- participation portal, as well as the websites of the related ministries of education, labour, social services, health, finance and environment as applicable. The aggregate score of the three dimensions is expressed in a 0-1 scale where one is the best and zero the worst. 7. E-Participation Index (EPI) The e-participation index (EPI) is derived as a supplementary index to the UN E-Government Survey. It extends the dimension of the Survey by focusing on the use of online services to facilitate provision of information by governments to citizens (e-information sharing), interaction with stakeholders (e-consultation) and engagement in decision-making processes (e-decision-making). The aggregate score of the index is expressed in 0-1 scale where one is the best and zero the worst.</p>
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Source: www.unegovernmentsurvey

Annexure 8: DV – Measurement Indicators

<p>8. B2C e-commerce index: The UNCTAD B2C E-commerce Index is composed of four indicators: Internet use penetration, secure servers per 1 million inhabitants, credit card penetration and a postal reliability score. Surveys on Internet use are carried out in a number of countries. Such data are compiled by the International Telecommunication Union (ITU), which also provides estimates. The online shopping process involves purchasing from an e-commerce web presence. Ideally this would be represented by an indicator such as the percentage of enterprises that sell via a B2C web presence (whether their own website or through a marketplace). A related indicator – the proportion of enterprises with B2C sales – is included in some enterprise surveys such as those used by Eurostat. The number of secure Internet servers was selected as a proxy given that most ecommerce sites need to employ security protocols to safeguard payment and personal information, and it has been used before. Credit cards are the most prevalent payment method worldwide in terms of online transaction purchase value. The indicator used</p>	<p>was the proportion of the population that received home postal delivery. For the 2016 Index, another indicator was chosen: the UPU postal reliability score. The aggregate score is expressed in a scale of 0-100 where 100 represents the best and zero for worst. 9. e-business usage: For e-business usage the 7th pillar of the Global Information Technology Index 'business usage' has been adopted which is computed on the basis of seven components, viz., a) Firm level technology absorption (In your country, to what extent do businesses adopt new technology? 1= not at all, 7= adopt extensively); b) Capacity for innovation (In your country, to what extent companies do have the capacity to innovate? 1= not at all, 7= to a great extent); c) PCT patents application (Number of applications filed under Patents Cooperation Treaty (PCT) per million population); d) ICT use for B2B transactions (In your country, to what extent do businesses use ICTs for transactions with other businesses?)</p>
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<p>is credit card penetration among the population aged 15 years and older, collected as part of the World Bank's Global Findex survey.</p> <p>A product ordered on line must be delivered. Delivery of physical goods is a key consumer concern. In the 2014 B2C e-Commerce Index, only physical delivery was considered and the indicator that was selected</p>	<p>1 = not at all; 7 = to a great extent);</p> <p>e) B2C internet use (In your country, to what extent do businesses use the Internet for selling their goods and services to consumers? 1 = not at all; 7 = to a great extent); and</p> <p>f) Extent of staff training (In your country, to what extent do companies invest in training and employee development? 1 = not at all; 7 = to a great extent).</p>
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Source: www.unctad.org; www.weforum.org

Annexure 9: Hausman Test Results

Variables	Coefficient Fixed (b)	Coefficient Random (B)	Difference b - B	Std. Error
LN cci	.0401823	.0452136	-.0050313	-
LN bsi	.9477535	1.649378	-.7016245	.2006166
LN tri	.4131683	.7739114	-.3607431	.0568676
LN egsi	.0429226	.0656794	-.0227568	-

Ho : difference in coefficients not systematic
Chi-square = 57.75
p-value = 0.0000

Source: Developed by Researcher

Annexure 10 : Country specific estimated parameters (u_i)

Country	Estimate	P > t	Country	Estimate	P > t
Albania	0.0000		Kyrgyz Republic	0.4511	0.0147
Algeria	0.4468	0.0094	Latvia	-0.3770	0.0241
Angola	-0.0148	0.9295	Lebanon	0.5033	0.0118
Argentina	-0.2216	0.2084	Lesotho	0.3550	0.0576
Armenia	0.3843	0.0301	Lithuania	-0.9595	<.0001
Australia	0.2106	0.2309	Luxembourg	0.3894	0.0672
Austria	0.6471	0.0061	Madagascar	0.7808	0.0023
Azerbaijan	0.6517	0.0147	Malawi	-0.3480	0.0363
Bahrain	0.3145	0.0905	Malaysia	-0.8962	<.0001
Bangladesh	0.3698	0.0838	Mali	0.3291	0.1725
Barbados	-0.6889	<.0001	Malta	-0.3591	0.0309
Belgium	-3.6347	<.0001	Mauritania	0.4742	0.031
Benin	-0.2385	0.3606	Mauritius	-3.3089	<.0001
Bolivia	-0.7457	<.0001	Mexico	0.2108	0.2971
Bosnia and Herzegovina	-0.1914	0.2585	Moldova	0.2178	0.2647
Botswana	0.3125	0.0681	Mongolia	0.2806	0.1108
Brazil	-0.2837	0.0969	Montenegro	-0.2515	0.1491
Bulgaria	0.3950	0.0499	Morocco	0.0579	0.7514
Burkina Faso	0.4280	0.0196	Mozambique	0.0876	0.6253
Burundi	-0.8287	<.0001	Namibia	-0.3677	0.0258
Cambodia	-1.1947	<.0001	Nepal	-3.4600	<.0001
Cameroon	-0.2097	0.2162	Netherlands	-0.1559	0.3435
Canada	-0.3826	0.0238	New Zealand	0.6350	0.0223
Cape Verde	0.6695	0.0058	Nicaragua	0.6361	0.0079
Chad	-3.5369	<.0001	Nigeria	-0.2148	0.1925
Chile	-3.1980	<.0001	Norway	-0.1070	0.5374
China	0.3563	0.0807	Oman	0.7201	0.0063
Colombia	0.2471	0.2153	Pakistan	0.0305	0.8779
Costa Rica	0.1003	0.5973	Panama	-0.0110	0.9493
Côte d'Ivoire	0.2581	0.218	Paraguay	0.0036	0.9858
Croatia	0.4972	0.0081	Peru	0.2691	0.1063
Cyprus	0.5312	0.0089	Philippines	0.0722	0.6903
Czech Republic	0.5547	0.0107	Poland	-0.0870	0.6571
Denmark	-0.7114	<.0001	Portugal	0.4103	0.0377
Dominican Republic	0.7076	0.0084	Qatar	0.4366	0.0405
Ecuador	0.2227	0.2184	Romania	0.1314	0.6076
Egypt	-0.4879	0.006	Russian Federation	0.4075	0.0243
El Salvador	0.1290	0.4623	Rwanda	0.4305	0.0175
Estonia	0.0639	0.7277	Saudi Arabia	-0.7521	<.0001
Ethiopia	0.5792	0.007	Senegal	0.1534	0.4887
Finland	-0.4714	0.0051	Serbia	-0.4135	0.0205
France	0.8039	0.0026	Seychelles	0.4043	0.0222
Gambia, The	0.5915	0.0187	Singapore	-3.7669	<.0001
Georgia	-3.4487	<.0001	Slovak Republic	0.5217	0.0439
Germany	0.2140	0.2201	Slovenia	0.5394	0.0056
Ghana	0.6472	0.0201	South Africa	0.6142	0.0029
Greece	-0.3864	0.029	Spain	0.2951	0.1503
Guatemala	0.3415	0.0744	Sri Lanka	0.4455	0.0459
Guyana	-0.0686	0.7202	Swaziland	0.0290	0.8841
Haiti	-3.4890	<.0001	Sweden	-0.2634	0.1142
Honduras	-0.1479	0.3888	Switzerland	0.7114	0.0098
Hungary	0.0329	0.8539	Tajikistan	0.7287	0.0106
Iceland	0.5357	0.0041	Tanzania	-0.0935	0.5914
India	0.7529	0.0018	Thailand	-0.7138	<.0001
Indonesia	0.0138	0.9434	Trinidad and Tobago	0.1596	0.4231
Iran, Islamic Rep.	-0.0789	0.692	Turkey	0.3667	0.0461
Ireland	0.2484	0.1403	Uganda	0.4357	0.0262
Israel	0.5402	0.0328	Ukraine	-0.5369	0.0014
Italy	0.7658	0.0018	United Arab Emirates	0.4860	0.0052
Jamaica	0.3444	0.1318	United Kingdom	0.1408	0.5766
Japan	0.2543	0.1628	United States	0.5457	0.047
Jordan	0.7476	0.0079	Uruguay	0.6459	0.0175
Kazakhstan	-0.1412	0.474	Venezuela	0.3964	0.0357
Kenya	0.1308	0.4733	Vietnam	0.0459	0.7838
Korea, Rep.	-0.4580	0.0156	Zambia	0.0248	0.8856
Kuwait	0.7660	0.0016	Zimbabwe	-0.1544	0.3808

Source: Developed by Researcher

Annexure 11: African country specific estimated parameter (u_i)

Country	Estimate	S. Er	t-value	P > t
Algeria	0	0	0	0
Angola	0.1038	0.1469	0.71	0.4812
Benin	-0.1478	0.1602	-0.92	0.3581
Botswana	-0.6665	0.1413	-4.72	<.0001
Burkina Faso	-0.1702	0.1564	-1.09	0.2783
Burundi	-0.7798	0.144	-5.42	<.0001
Côte d'Ivoire	-1.0675	0.1554	-6.87	<.0001
Cameroon	-0.2817	0.1479	-1.9	0.059
Cape Verde	-3.5378	0.1477	-23.95	<.0001
Chad	-3.1214	0.1624	-19.22	<.0001
Egypt	-0.6324	0.1472	-4.3	<.0001
Ethiopia	0.1154	0.1598	0.72	0.4716
Gambia	-0.3720	0.1474	-2.52	0.0128
Ghana	-3.4513	0.1652	-20.89	<.0001
Kenya	-0.2995	0.1631	-1.84	0.0685
Lesotho	-0.4212	0.1785	-2.36	0.0198
Madagascar	-0.8319	0.1445	-5.76	<.0001
Malawi	-0.2779	0.1423	-1.95	0.053
Mali	-0.8085	0.1443	-5.6	<.0001
Mauritania	-0.3508	0.1443	-2.43	0.0164
Mauritius	-3.2508	0.1475	-22.03	<.0001
Morocco	0.2376	0.1982	1.2	0.2328
Mozambique	0.0434	0.1647	0.26	0.7926
Namibia	-0.2890	0.1428	-2.02	0.045
Nigeria	-3.4114	0.1536	-22.2	<.0001
Rwanda	-0.1123	0.1546	-0.73	0.4687
Senegal	-0.6305	0.1666	-3.78	0.0002
Seychelles	-0.3853	0.162	-2.38	0.0188
South Africa	-3.6403	0.1714	-21.23	<.0001
Swaziland	0.2284	0.1999	1.14	0.2552
Tanzania	-0.1756	0.1442	-1.22	0.2253
Uganda	-0.6045	0.1494	-4.05	<.0001
Zambia	-0.4720	0.1452	-3.25	0.0015
Zimbabwe	-0.0677	0.1592	-0.42	0.6716

Source: Developed by Researcher

Annexure 12: Asia & Oceania country specific estimated parameter (u_i)

Country	Estimate	S. Er	t-value	P > t
Armenia	0	0	0	0
Australia	0.1781	0.0783	2.28	0.0244
Azerbaijan	0.7099	0.1559	4.55	<.0001
Bahrain	0.2815	0.089	3.16	0.0019
Bangladesh	0.4124	0.1252	3.29	0.0013
Cambodia	-0.7638	0.0875	-8.73	<.0001
China	-0.3102	0.0807	-3.85	0.0002
Cyprus	0.2413	0.1033	2.34	0.0209
Georgia	0.4909	0.1101	4.46	<.0001
India	0.2238	0.081	2.76	0.0065
Indonesia	-0.0234	0.1006	-0.23	0.8166
Iran	-0.1234	0.1035	-1.19	0.2351
Israel	0.1882	0.0823	2.29	0.0236
Japan	0.8149	0.1658	4.92	<.0001
Jordan	0.7717	0.207	3.73	0.0003
Kazakhstan	-0.1846	0.1003	-1.84	0.0679
Korea, Rep.	0.1708	0.0864	1.98	0.0499
Kuwait	0.8280	0.1618	5.12	<.0001
Kyrgyzstan	0.4335	0.0857	5.06	<.0001
Lebanon	-0.3943	0.0871	-4.53	<.0001
Malaysia	0.3116	0.0902	3.45	0.0007
Mongolia	0.3318	0.1581	2.1	0.0376
Nepal	-0.2167	0.0854	-2.54	0.0122
New Zealand	-0.2689	0.1027	-2.62	0.0098
Oman	0.6892	0.16	4.31	<.0001
Pakistan	0.0469	0.1025	0.46	0.6481
Philippines	-0.0991	0.0857	-1.16	0.2493
Qatar	-0.1011	0.0985	-1.03	0.3061
Saudi Arabia	0.1452	0.178	0.82	0.416
Singapore	0.1704	0.1331	1.28	0.2024
Sri Lanka	0.5822	0.1854	3.14	0.0021
Tajikistan	-0.0117	0.1039	-0.11	0.9106
Thailand	-0.1832	0.0828	-2.21	0.0287
Turkey	0.1375	0.1029	1.34	0.1838
United Ar Emi	0.3948	0.099	3.99	0.0001
Viet Nam	0.1752	0.174	1.01	0.3157

Source: Developed by Researcher

Annexure 13: Lower Middle Income Country specific estimated parameter (u_i)

Country	Estimate	S. Er	t-value	P > t
Angola	0	0	0	0
Armenia	0.0369	0.1617	0.23	0.82
Bangladesh	0.3386	0.1206	2.81	0.0057
Bolivia	-0.4907	0.1109	-4.43	<.0001
Cabo Verde	0.0544	0.1155	0.47	0.6383
Cambodia	-0.0415	0.105	-0.4	0.6934
Cameroon	-0.1980	0.1071	-1.85	0.0667
Côte d'Ivoire	-3.3932	0.1187	-28.6	<.0001
Egypt	-0.5304	0.1062	-4.99	<.0001
El Salvador	0.2753	0.1149	2.4	0.0179
Georgia	0.1829	0.1166	1.57	0.1191
Ghana	0.4188	0.1357	3.09	0.0025
Guatemala	-0.1992	0.107	-1.86	0.0647
Honduras	0.0250	0.1183	0.21	0.8332
India	0.1645	0.1079	1.52	0.1297
Indonesia	0.1730	0.1147	1.51	0.1339
Jordan	0.0481	0.126	0.38	0.703
Kenya	-0.0401	0.1321	-0.3	0.7619
Kyrgyz Rep.	-0.3344	0.1131	-2.96	0.0037
Lesotho	-0.1534	0.1192	-1.29	0.2004
Mauritania	-0.7354	0.1216	-6.05	<.0001
Mongolia	-3.1081	0.1421	-21.88	<.0001
Moldova	0.4422	0.1524	2.9	0.0044
Morocco	-0.0315	0.1418	-0.22	0.8245
Nicaragua	0.2049	0.1259	1.63	0.1061
Nigeria	0.0010	0.1159	0.01	0.993
Pakistan	0.0096	0.1051	0.09	0.9275
Philippines	0.1258	0.1039	1.21	0.2281
Sri Lanka	0.0625	0.133	0.47	0.6393
Swaziland	0.1698	0.1219	1.39	0.166
Tajikistan	-0.0662	0.1124	-0.59	0.5567
Ukraine	0.1018	0.1032	0.99	0.3258
Vietnam	0.5633	0.1194	4.72	<.0001
Zambia	0.2197	0.1146	1.92	0.0575

Source: Developed by Researcher

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