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A Global Analysis of the Effect of IT Capacity on Development – Understanding Sourcing of Skills

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Abstract

The use of IT to support global processes has opened up opportunities for some countries to source skills from other countries often located in very different parts of the world. This study investigates the relationship between ICT Capacity and Skills and their effects on Economic Development from 2001 to 2005 for each of the 183 countries that are members of the United Nations. Following an analysis of ICT Capacity and its relationship to Skills and Economic Development, this paper reports positive correlations. The contribution of this paper is in the development and testing of a conceptual model that illustrates these correlations and explains why digital divides are narrowing in some countries but widening in others. This relationship between ICT capacity and skills has implications for the global sourcing of skills between countries and regions.

Keywords:

Information and Communication Technology Capacity, Social & Economic Development.

1. Introduction

The increasing globalization of the world economy has meant that countries are becoming more dependent upon each other for resources. In particular, access to information, expertise and knowledge is a key determinant of those able to participate in this global economy supported by multiple types of Information Communication and Technology (ICT) infrastructures. In his book, the "Runaway World", Giddens (2003) suggests that information literacy is paramount for those wanting to survive in this interconnected world. He suggests that the more science and technology intrude into our lives, the more active or engaged our relationship to it becomes. International development agencies highlight problems of exclusion from the knowledge economy where know-how replaces land and capital as the basic building blocks of growth (Norris 2001, UNDP 2003, World Bank 2003). A World Bank study found that 90% of the world's internet subscribers are in countries whose population is 15% of the global total (Dasgupta et al. 2004). In a study of 183 nations in the world, the International Telecommunication Union (ITU) devised a new set of metrics called the ICT Opportunity Index (ICT-OI). The ICT-OI is used to measure access to and usage of ICT by individuals and households. The fundamental principle behind this index has been to interpret the notion of ICT access and usage within the context of a global Information Society, thus recognizing that ICT opportunities are an important part of social development. The results from these studies show that there is a significant difference between the information rich and information poor – more commonly referred to as the Digital Divide.

Evidence from recent studies shows that this digital divide is closing rapidly and is bringing to light a more profound divide: that of the social gap between those who have access to the basic social services such as education and their effects on development of communities that are often rural. Keen (2007) takes a view of the Digital Divide that is very different from the orthodox perspectives of others in the field of development. His core argument for bypassing the Digital Divide is how to leverage the resourceful, inventive and energetic talent pools of poor countries so that they can be innovators on their own behalf and help their families and communities live a better life. And so the Digital Divide needs to be addressed from a social rather than a technological innovation standpoint. Qureshi, Keen and Kamal (2007) have addressed this by illustrating how knowledge networking enables the social divide to be bridged through processes of migration, education and civic engagement on the part of a country's population. This, in turn, paves the way for enabling the decision making on global capability sourcing (Keen and Qureshi 2006).

It then appears that our understanding of technology development, adoption and use changes in the context of a multi-country environment. This implies that if there is a skill gap among economies, with the use of Information and Communication Technology (ICT) Infrastructures, the imbalances will correct themselves through sourcing of talent and services. The question we investigate in this paper is: How does ICT capacity affect this skill gap? It appears that there is a connection between the ICT capacity of a country and its ability to create new jobs and opportunities. The second question we investigate is what is the relationship between ICT Capacity and a broader Social development construct – made operational through a skills indicator - to Economic Development? These differences in ICT capacity, as they relate to skills, could potentially bring an economy into a positive growth spiral causing these countries to invest in skills that they require. Conversely, countries with stagnant growth could potentially bring about a net outflow of talent to higher growth countries. This relationship between ICT capacity and skills has implications for the global sourcing of goods and services between countries and regions. This study investigates the relationship between ICT capacity and skills and their effects on economic growth from 2001 to 2005 for each of the 183 countries that are members of the United Nations. Following an analysis of ICT capacity and its relationship to skills, this paper reports positive correlations between these two constructs. However, surprisingly, no relationship between ICT capacity and economic growth was found. On the other hand, skills and growth appears to have significant bi-directional relationship.

2. Theoretical Model

The following sections develop a conceptual model comprising of theoretical contributions from Information Technology for Development as they relate to ICT capacity, Social and Economic Development. All these three issues are important in the general context and are salient aspects of that which we are examining and are interested to see whether any relationships exists among them.

2.1 Information and Communications Technology Capacity

The capacity of a country's information and communication technology infrastructure can potentially decrease the digital divide if coupled with adoption as it relates to local needs. Research in IT for Development provides specific insight into approaches through which information systems can be implemented and adopted in a variety of cultural contexts and global environments. This area of research has implications for increasing the relevance of areas such as adoption and diffusion of IT (Davis, 1989, Venkatesh et al 2003), and developing methods and approaches for implementing IS for global environments; and has relevance for managing dispersed collaborative environments in a variety of contexts including off-shore outsourcing (Tractinsky and Jarvenpaa 1995, and Qureshi and Zigurs 2001).

In drawing upon the above research, the adoption and use of IT in developing countries has been seen to bring about development in countries and economies as they relate to each other (Qureshi 2005, Cecchini and Scott 2003, Steinberg 2003, Qiang et al 2003, and Avgerou 1998). This suggests that ICT Capacity is being used to stimulate infrastructures for mobile and distributed communication and access to resources. A World Bank definition suggests that the term ICT "… comprises hardware, software, networks, and media for the collection, storage, processing, transmission and presentation of information" (World Bank 2003, p.1). This term denotes a collection of technologies that can be used to stimulate development. Steinberg (2003) suggests that ICT is highly versatile and can help support development efforts if employed judiciously. However, a key issue is not unequal access to computers but the unequal ways that computers are used (Warschauer 2003). It is these unequal ways that need to be addressed through the phenomena of social development.

2.2 Social Development

The social perspective of development has its focus on improving core aspects in a society such as healthcare, education, environment and community services (Hamelink, 2002). For the purposes of this study, the broader social development construct will be confined to literacy and education since we are focused on understanding the sourcing of skills. Now, a key component in understanding the social divide is the development and access to social capital. In simplistic terms, social capital refers to the characteristic of social interactions and networks that can provide value added resources to a society. In the context of world development, increasing importance of social capital is being recognized as a key component affecting the increase in incomes (Fine 1999). Serageldin & Grooteart (2000) suggest that, at any given time, every country has appropriate levels of social capital, and that over time the total composition of social capital should increase through accumulation.

Steinmuller (2004) claims that ICTs may help communities of practice to have enhanced capabilities of global sourcing of knowledge and problem-solving activities resulting in greater social capital. Steinmuller goes on to say that the social networks of communities of practice help extend knowledge markets. In addition, he states that changes in communities of practice that are impacted by ICTs may have implications for growth, competitiveness, and employment. It then appears that ICTs have a role to play in enhancing and promoting social capital within communities and in turn serve as a strong force in enabling literacy and education within and among communities.

2.3 Economic Development

Schumpeter's (2002) theory of economic development suggests that innovations, such as Information Technologies, can enable an economy to stimulate growth. He also suggests that education has the effect of increasing the ability of factors of production to generate income and growth. Schumpeter's contribution to development economics is the concept that economies go through cycles of growth. He suggests that through technical and organizational progress, development takes place as knowledge progresses. New technical innovations can bring about development if they offer opportunities for new enterprises. In addition to being an economic phenomenon, Schumpeter purports that development is essentially a disturbance of equilibrium of the economy which he suggests is a static one. The third characteristic of development, according to Schumpeter, is that it occurs in waves or separate partial developments that follow one upon the other. While development brings about gains in value, it also leads to losses in value (Schumpeter 2002). This view of

economic development theory has been influential in studying changes in economies at the global level.
From the above it appears that there is a relationship between available ICT capacity and the country's corresponding development of skills of its population. ICT capacity of an economy can be taken to mean a composite measure of its existing ICT network infrastructure, ICT uptake and ICT intensity of use – which simply refers to an economy's ICT consumption within a given period. In terms of skills development in an economy, it may be a consideration of educational enrolment and literacy. Education and literacy together represent best available indicators for reflecting the extent to which knowledge-based inputs enhance awareness of ICT goods and services which, in turn, impact on access and usage, according to the ITU report (2007). The following model depicts the constructs measured in this study:

Figure 1. Conceptual Model

ICT capacity is comprised of the following indicators termed ICT networks, ICT uptake and Intensity of Use. Skills development comprises an education & literacy indicator and the Economic Development indicator is annual growth rate. (A breakdown and related definitions of these is illustrated in the appendix). This model suggests that an increase in ICT capacity can enable an increase in skills by providing greater access to education and resources to obtain an education, leading us to the following hypotheses:

Hypotheses

1. **H1**: *Countries with high ICT Capacity will have high levels of Skill development*

   This is a comparison between our sample of 183 countries to investigate the nature of the relationship between ICT capacity and the amount of skill development in our sample of countries.
2. **H2**: A*n increase in ICT Capacity brings about an increase in Skill development over time*

   This hypothesis will investigate the trend of the relationship between these two constructs over time, for each country, over the period of 2001-2005.
3. **H3**: *An increase in Skill development brings about increase in Economic Development*
4. **H4:** *An increase in ICT Capacity brings about increase in Economic Development*

The methodology section depicts the mode of computation that was utilized in calculating values for each of the indicators for the three constructs (see Appendix for a list of indicators and their sub-indicators for each construct).

3. Methodology

Data for this study was taken from the latest release of the ITU report (2007) that provides telecommunications data on 183 countries world-wide. The manner in which ITU have computed the indicators is explained below. There are two main steps used to compute the indicators for each of the constructs – ICT capacity, skill development, and economic development.

1. The first step is to express each of the sub-indicators for each of the top level indicators (see Appendix) in index form. For example, if the top level indicator is Networks (for the ICT capacity construct), then the sub-indicators are *main telephone lines per 100 inhabitants, mobile cellular subscribers per 100 inhabitants, and international internet bandwidth*. These sub-indicators are taken to be expressed in index form using the following expression: $\mathbf{I_t^{\,i,j} = (V_t^{\,i,j} \,/\, V_{t0}^{\,i,c}) * 100}$ where *I* stands for the value of the index, *i* refers to individual indicators such as *main telephone lines per 100 inhabitants, or mobile cellular subscribers per 100 inhabitants, or international internet bandwidth*. *V* refers to the raw values of the indicators, *t0* refers to the reference year (2001) and *t* to any other year, *c* refers to the reference country. For example, say we want to transform the indicators, *main telephone lines per 100 inhabitants, mobile cellular subscribers per 100 inhabitants, and international internet bandwidth* for Hong Kong for the year 2005. Then, we would obtain the following expressions:

$\mathbf{I_{2005}^{\text{main telephone lines, Hong Kong}} = (V_{2005}^{\text{main telephone lines, Hong Kong}} \,/\, V_{2001}^{\text{main telephone lines, Reference Country}}) * 100}$ -------expr 1

$\mathbf{I_{2005}^{\text{mobile subscribers, Hong Kong}} = (V_{2005}^{\text{mobile subscribers, Hong Kong}} \,/\, V_{2001}^{\text{mobile subscribers, Reference Country}}) * 100}$ ----------- expr 2

$\mathbf{I_{2005}^{\text{intn'l internet bandwidth, Hong Kong}} = (V_{2005}^{\text{intn'l internet bandwidth, Hong Kong}} \,/\, V_{2001}^{\text{intn'l internet bandwidth, Reference Country}}) * 100}$ -- expr 3

The above expressions 1, 2, 3 give us the indices for computing the Networks value for Hong Kong in the year 2005. We will follow the same method to express the indices for computing the Skills value for Hong Kong in the year 2005. Skills is composed of two sub-indicators, that of *adult literacy rates, and gross enrollment rates*. The expressions for transforming these two sub-indicators into indices are as follows:

$\mathbf{I_{2005}^{\text{adult literacy, Hong Kong}} = (V_{2005}^{\text{adult literacy, Hong Kong}} \,/\, V_{2001}^{\text{adult literacy, Reference Country}}) * 100}$ -------------------------expr 4

$\mathbf{I_{2005}^{\text{gross enrollment, Hong Kong}} = (V_{2005}^{\text{gross enrollment, Hong Kong}} \,/\, V_{2001}^{\text{gross enrollment, Reference Country}}) * 100}$ ---------------- expr 5

2. The second step is to proceed to aggregate across each component. In other words, the sub-indices will now be aggregated to form their top level indicator. Specifically, the sub-indices, *main telephone lines per 100 inhabitants, mobile cellular subscribers per 100 inhabitants, and international internet bandwidth* will be aggregated to form the Networks indicator. And the sub-indices, *adult literacy rates, and gross enrollment rates* will be aggregated to form the Skills indicator. The following expression is used for the aggregation:

$$\hat{I}_t^{\,i,j(c)} = \sqrt[n]{\prod_{i=1}^{n} I_{n,t}^{\,i,j(c)}}$$

where Π denotes product and *n* the number of each component's individual index. For networks n=3 (fixed, mobile and bandwidth), for skills n=2 (literacy and gross enrolment). Therefore, for our example we would obtain the Networks indicator value for Hong Kong in 2005 from the following expression:

$$\mathbf{\hat{I}_{2005}^{\text{NETWORKS, Hong Kong}} = \sqrt[3]{\prod_{i=1}^{n=3} I^{\text{i, Hong Kong}}_{\text{n, 2005}}}}$$

where each of the $I^{\text{i, Hong Kong}}$ is the values of the sub-indices, $\mathbf{I_{2005}^{\text{main telephone lines, Hong Kong}}}$, $\mathbf{I_{2005}^{\text{mobile subscribers, Hong Kong}}}$, and $\mathbf{I_{2005}^{\text{intn'l internet bandwidth}}}$. And the expression for the Skills value for Hong Kong in 2005 is:

$\hat{I}_{2005}^{\text{SKILLS, Hong Kong}} = \sqrt[3]{\prod_{i=1}^{n=3} I^{\text{i, Hong Kong}}_{\text{n, 2005}}}$

where each of the $I^{\text{i, Hong Kong}}$ is the values of the sub-indices, $\mathbf{I_{2005}}^{\text{adult literacy, Hong Kong}}$, and $\mathbf{I_{2005}}^{\text{gross enrollment, Hong Kong}}$.

The same method as outlined in steps 1 and 2 are carried out to obtain the values for the uptake indicator, as well as the intensity indicator values for each country, for each of the years ranging from 2001 to 2005. The following results section depicts the results obtained from investigating the four hypotheses. Statistical tests were conducted using SPSS version-14.

4. Results

To test **H1**: *Countries with high ICT Capacity will have high levels of Skill development*, we used a sample of 183 countries. ICT capacity is operationally defined to be composed of networks, uptake and intensity. Skill development is made operational through the education & literacy indicator. To investigate whether ICT capacity has a relationship with Skill development, we carried out a multiple regression analysis, with the indicators, networks, uptake and intensity as the independent variables and education & literacy as the dependent variable. The multiple regression results show that networks, uptake and intensity *together* account for 53.2% of the variance in education & literacy with $R = 0.735$ and $p < 0.05$, therefore indicating a significant directional relationship between ICT capacity and Skill development. This is represented by the arrow A1 in Figure 2. Additionally, we investigated whether the reverse held true. In this case, a multivariate regression analysis was conducted since in this instance we have three dependent variables, networks, uptake and intensity and one independent variable – education & literacy (is represented by one indicator). The results showed that education & literacy have a significant relationship with networks, uptake and intensity as a whole (Wilks' Lambda = 0.460, $p < 0.05$). The results also show that education & literacy has significant relationships individually with networks, uptake, and intensity (p-value < 0.05 in each of the three cases). Therefore, this implies that there is also a directional relationship from Skill development to ICT infrastructure. This relationship is given by arrow A2 in Figure 2.

For the second hypothesis **H2**: *An increase in ICT Capacity brings about an increase in Skill development over time,* we test the nature of the relationship between ICT capacity and that of Skill development over time – specifically between the years of 2001 to 2005. In order to investigate this relationship, once again the samples of 183 countries were used. The ITU report (2007) gives the values for networks, info-density (aggregation of networks and skills), and info-use (aggregation of uptake and intensity) for each of the years, 2001 – 2005. For the purposes of this study, we need to extract the skills values from within the info-density values given for each year. This was done using the formula given in the Methodology section which is:

$\text{Infodensity} = \sqrt[2]{\mathbf{I}^{\text{Netwotks, c}}_{t} * \mathbf{I}^{\text{Skills, c}}_{t}}$

$\mathbf{I}^{\text{Skills, c}}_{t} = (\text{Infodensity})^2 / \mathbf{I}^{\text{Netwotks, c}}_{t}$

Hence, knowing the info-density and networks values for each of the 183 countries for each of the years 2001 – 2005, we were able to compute the skills values for each country for each year in the period 2001 – 2005. The next step was to compute the average of all the network values from 2001 – 2005 for each country. Similarly, the average of all the skills values from 2001 – 2005 were calculated. A linear regression analysis was then conducted on the averages of networks as independent variables and average skills as dependent variable for each country. The regression results show that there is a significant relationship between the averages of both networks and skills ($R = 0.691$, $p < 0.05$). Another linear regression was conducted on the averages of info-use as independent variable and average skills as dependent variable. The regression analysis shows that there is a significant relationship between the two with $R = 0.682$ and $p < 0.05$. It can therefore be implied that over time, specifically from 2001 – 2005, increase in the ICT capacity will have an increase in the development of skills as both the individual regression analysis show evidence that networks as well as info-use (aggregation of uptake and intensity) have significant relationships.

In order to test **H3**: *An increase in Skill development brings about increase in Economic Development*, we utilize the same set of data from the 183 countries from the ITU report (2007). Here, the construct growth is made operational through annual growth rates. The ITU report provided the average annual growth rates from 2001 to 2005 for each of the 183 countries. We use this data to conduct a linear regression analysis where we take the average skills values from 2001 to 2005 for each country (computed earlier from testing H2) and make it the independent variable and regress it on the average annual growth rate which is then the dependent variable. The regression analysis results show that a significant relationship exists with $R = 0.174$ and $p < 0.05$. This implies that H3 holds true. This relationship is shown by arrow A3 in Figure 2. In order to test whether there is a bi-directional relationship between Economic development and Skill development, we also investigated the reverse scenario. In other words, a regression was carried out but in this case, the independent variable was the average annual growth rate and the dependent variable was the average skills values. Here also, a significant relationship was found ($R = 0.174$ and $p < 0.05$). This relationship is given by arrow A4 in Figure 2. Therefore, economic development and Skill development have bi-directional relationships.

For the fourth hypothesis **H4**: *An increase in ICT Capacity brings about increase in Economic Development* we carried out a multiple regression with the averages of networks, and averages of info-use (aggregation of uptake and intensity) as the independent variables and the average annual growth rate as the dependent variable. The results show that there is no significant relationship between ICT capacity and Economic development ($p > 0.05$). This non-significant finding prompted us to investigate whether there would then be a reverse directional relationship. In other words, whether economic development would be a driver for ICT capacity or not. In order to test this relationship, we carried out a multivariate regression analysis with the average annual growth as the independent variable and the averages of networks and averages of info-use (aggregation of uptake and intensity) as the dependent variables. The multivariate analysis revealed that economic development had no significant relationship with ICT capacity (Wilks' Lambda = 0.986, $p > 0.05$). Therefore, this implies that there is no relationship in either direction between ICT capacity and economic development.

Considering the results obtained from the above statistical analysis, the revised model is given in figure 2.

5. Analysis

The relationships among ICT Capacity, Social development – with respect to development of skills - and Economic Development give rise to dynamics that vary considerably in countries around the world. Skills are especially volatile, given their ability to be imported (and exported). We suggest that the nature of the balance between ICT capacity and skills is going to influence inflow or outflow of talent. For example, Finland has experienced ICT capacity growth over time but skills have remained relatively constant, given the small population and relatively saturated opportunities for skill growth. To meet skill needs, Finland tends to import talent as well as engage in outsourcing of skills-based projects to other countries such as China which has a relatively strong skills supply. Hong Kong (with a population similar to Finland) follows a similar course of action in buying its skills using sourcing strategies that enables it to purchase the talent from other regions, again heavily from mainland China, given the close proximity and (relatively) similar language. Taiwan is also running out of local skills and, again, outsourcing to mainland China where requisite skills are in greater abundance at affordable prices. As such, these countries with high skill levels, but ever increasing ICT Capacity and associated skills needs, can continue to flourish, courtesy of importing skills and/or outsourcing.

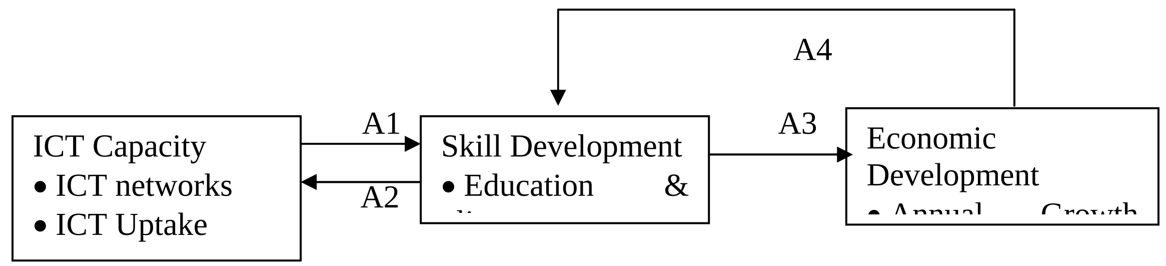

Figure 2. Revised Model

Countries with a relatively low presence of skills but high ICT Capacity can also (like their highly skill counterparts) source their talent from countries with high skills ratio. The UAE is in such a position and has the resources to import needed skills while simultaneously seeking to educate the local population to achieve a better long term balance between ICT Capacity and Skills. Countries such as Greece, however, are not in as fortunate a situation and remain with no significant increase in skills. Countries such as Estonia which supplies some skills to Finland draws, to some extent, upon Belarus to balance its skills needs with ICT Capacity. In general, the absence of a balance between ICT capacity infrastructure and low Skill development initially means that there will be sourcing of talent from different countries. But in the long term, countries seek to build it internally. Stability exists when both ICT capacity and skills are high. One would presume that neither ICT Capacity nor development of skills alone lead to economic development, i.e., it takes both networks and skills. But our analysis of the data from the 183 countries revealed a very interesting and surprising finding that shows that there is no direct relationship between ICT capacity and economic development. It is unclear as to why this is the case and further research is needed to ascertain specificities regarding these two constructs.

Countries with both low ICT capacity and low Skill development face a daunting future. These will remain low if their skill sets are going elsewhere. For example, Nigeria has achieved an ICT Capacity / Skill set balance but remains underdeveloped. There is little in the way of a positive dynamic that can pull these countries out of their poverty balance. Elements of low stability and imbalances lead to the harsh reality that the rich will get richer and poor get poorer unless there is an innovation or some form of intervention. Positive examples do exist. For instance a micro-loan program and low cost mobile telephones have combined to give Bangladesh an opportunity to break out of the downward spiral and begin to achieve a modicum of economic development which is further enhancing the skill set in the presence of ICT capacity growth.

6. Conclusion

This study has provided a means for better understanding strategies for sourcing skills as it relates to ICT capacity on a global scale. An investigation of 183 countries revealed that high ICT Capacity does correlate to high levels of Skill development. The converse is also true. This study also found that an increase in ICT Capacity brings about an increase in the development of skills over time. An increase in the development of skills brings about an increase in growth; this is a bi-directional relationship. However there was no relationship between ICT Capacity and Economic Development.

The analysis of this paper suggests that the relationships among ICT Capacity, Social development and Economic Development are the basis upon which global sourcing strategies occur. Countries with high ICT Capacity and relatively constant level of skills will tend to source their talent from countries where skills are developing faster than ICT Capacity. Neither ICT Capacity, nor development of skills, alone, leads to Economic Development. Instead there is a dynamic between the two that brings about the need to source outside of a region or bring in business to stimulate growth. Through innovations in ICT Capacity and Skill development this dynamic can stabilize to provide continuing growth or in the absence of innovations or stimuli through public policy, a downward spiral widening the digital divide will take place.

The contribution of this paper is in the development and testing of a conceptual model that shows the correlations between ICT Capacity and skill development as they relate to Economic Development. These relationships explain the sourcing of talent between certain types of countries. Further research will consider a broader Social development construct and provide a more in-depth analysis to investigate the characteristics of countries as they relate to each other in terms of this model. The ITU report (2007), due to the lack of available data on ICT skilled labor, collected primary, secondary, and tertiary enrollment together with adult literacy numbers to come up with data on the skills indicator. This might confound the actual findings of the study. And so, future efforts will entail collection of ICT skilled labor force data which will be more representative of the skills indicator. Additionally, more in-depth analysis is needed in investigating the various characteristics of each country that might come into play as we talk about ICT capacity, Skill development and Economic Development. Future research efforts will also involve triangulating empirical findings with qualitative case studies from the sample of 183 countries utilized in this study to provider greater insight and improve upon the quality of the findings.

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Appendix

Constructs:

ICT Capacity

- **Networks:** According to the ITU report (2007), the extent of network and infrastructure development is captured through penetration rates of: 1) fixed telephone lines, 2) mobile cellular subscribers and 3) international internet bandwidth.

- **Uptake**: Uptake refers to the usage and consumption related parameters of ICT goods and services which are widely measured using the following indicators: 1) internet users per 100 inhabitants 3) computers per 100 inhabitants, and 4) proportion of households with TV.
- **Intensity of use**: Two indicators are used for computing the intensity of use due to limitation regarding data availability: 1) number of broadband internet subscribers per 100, and 2) international outgoing telephone traffic (minutes) per capita.

Skill Development

- **Skills**: Two areas: 1) Enrollment rates in the primary, secondary and tertiary sectors and 2) adult literacy rates were taken as inclusive reflections of wider productive and social opportunities to ICT penetration. Education enrollment and literacy figures represent best available indicators to reflect knowledge-based inputs and enhanced awareness to ICT goods and services (ref: ITU report p.4).

Growth rates

Economies are grouped by 2005 United States dollar (US$) income levels:

- *low*, Gross National Income (GNI) per capita of US$ 875 or less
- *lower middle*, US$ 876-3’465
- *upper middle*, US$ 3’466-10’725
- *high*, US$ 10’726 or more.

The income level classification is based on World Bank methodology, whereas the Gross Domestic Product (GDP) is based on per capita (ITU Report).