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Abstract:

In the wake of industrial revolution in the late 18th and 19th centuries, *technology* as a seminal force has impacted everything and its effects are much more beyond the pertinent human comprehension. Most of the studies use per capita GDP as a measure to map the economic well-being of any nation but it is a narrower indicator. *Human development* could be considered to be the key that acts as a binding force to absorb the technological driven advancements. Taking this perspective, we contemplate the emergent prerequisite of finding the association between human capital development and information & communication technology (ICT) framework. The current study attempts to analyze how advancement in ICT could promote human capital development with special reference to South Asian Region (SAR) over the period 2000-16 by employing panel fixed effects modeling. Where, social human capital is proxied by the *Human Development Index (HDI)* and the the *ICT penetration is measured by the parameters* like technological readiness, mobile cellular subscriptions, and internet penetration. This is supplemented by other key macroeconomic control variables like population growth, urbanization sprawl, etc. in order to obtain an umbrella view. In order to have an in-depth understanding, individual component level linkages of HDI such as per capita GDP, birth life expectancy and school enrollment rate with ICT and other macroeconomic demographic indicators are also tested separately.The empirical analysis results hint towards the strong positive associations of internet penetration, technological readiness, and mobile usage with the human development index. The overall results are found to be in sync with the key findings. Therefore, the study recommends a cohesive ecosystem that could amalgamate technological space with HDI in the contemporary framework. The study further concludes with the key policy implications.

Keywords: ICT, Human Development, Human Social Capital Development, Mobile, Internet, GDP, South Asia

Introduction

In the 21st century, the existing literature supports the growing eminence of information and communication technology (ICT) as a key to human capital development (Tchamyou, 2017; Kuada, 2015). In the contemporary era, this is aptly known as 'the Information Age' - a distinguished phase of rising digital knowledge to facilitate access to, and administration of information (Mason 1986; Castells 2010). Today, the pace and presence of ICT are indispensable in all the fields of human activities. ICT development has generated a major change in the world map (Castells, 2000). Parallely, the involvement of technology to improve not just growth and efficiency but human wellbeing too; is discussed on the broader platforms of both developing and developed nations. Even the World Economic Forum (WEF) recognizes the ICT role as a crucial enabler in order to ensure sustainable and balanced socio-economic development. ICT is also taken as an imperative component for desirable regional harmonization in the formation of larger competitive markets. ICT is proved to be instrumental in impacting various realms including the intangible (human) capital creation. The internet usage is suitably detailed to encourage and protect human rights in democratic control.

Areas like education, human development, and health have adopted the urge of emancipation and shall continue to discover the new advanced usage of digital knowledge as a key catalyst of behavioral transformations e.g., telemedicine investments (Rosser et al. 2009). By means of ICT both domestically and globally, human capital is progressively producing a sense of experience that is beyond the constraints of geographical space. It is only via ICT that people have multi-fold revelation to outward influences that have profound effects on identity and culture (Appadurai, 1996; Greig, 2002). In the words of Castells (2000), people are enjoying *timeless time* (the ability to operate real-time across nations) without interruption with convenience and without absolute difference between digital and physical proficiencies.

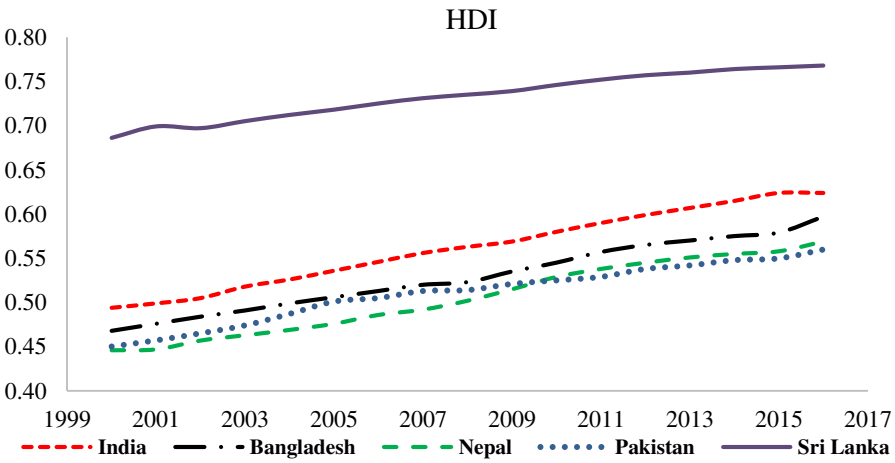
In fact, ICT tools are considered to be most powerful as per the World Bank's 'knowledge economy index' to exercise impact on human capital development due to its ability of penetration. In this area, one of the remarkable feats includes the *digital opportunity initiative*[1] (DOI) as was announced at the G-8 Okinawa Summit in the year 2000 that aims to ascertain the ICT roles in enhancing social equity and cultivating sustainable economic development. Undoubtedly, the impact of ICT can vary in different countries or regions depending upon its purpose of usage, its nature as well as its spatial diffusion strategy. It is apparent that the digital technology used for human capital creation still remains debatable and challenging. Such inadequacies could be addressed by appropriate digital tools in a cordial involvement of community and MNCs both throughout the transformation process.

In this backdrop, laying empirical evidences on the relationship between ICT and human development is of vital importance. Presently, there are a few studies that correlate information technology framework with economic development. While technology has essentially witnessed to a subsequent proliferation in the capital intensity, yet overall it has not squeezed socio-economic development in the economies. It therefore becomes really necessary to explore the nature of

possible linkages between ICT indicators and those exhibiting human development apprehensions for the attainment of the Millennium Development Goals (MDGs), particularly in a set of emerging economies like South Asian nations.

In general, the concept of 'human development' is highly debated and largely remains misperceived. Human Development Index (HDI[2]) is a composite qualitative indicator that depicts the level of social and economic development (well-being) of a country, coined by UNDP[3] in 1990. It primarily comprises three broad indices: education index, income index and life expectancy index. Alternatively, HDI includes a decent standard of living (given by GNI per capita), knowledge (given by expected years of schooling), and long and healthy life (with a holistic mix of qualitative and quantitative growth parameters).

Figure 1 Human Development Index Time Trends for South Asia



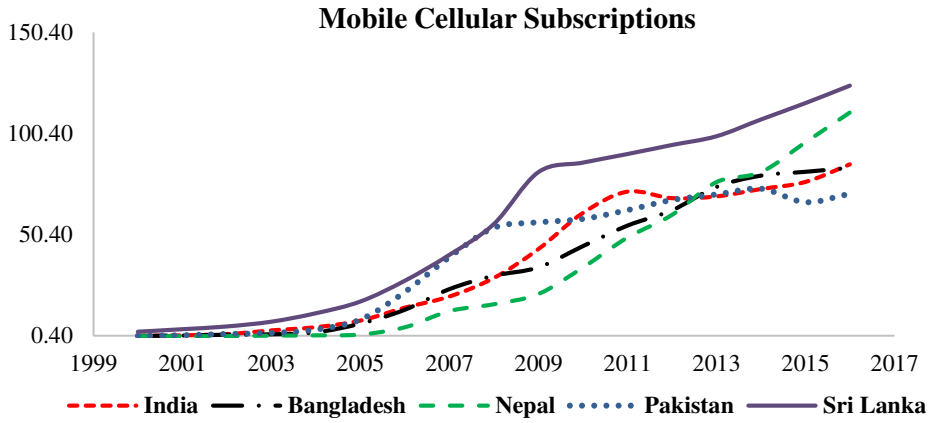
Source: Authors' representation using UNDP Human Development reports[4]

From Fig-1, it can be observed that HDI of all selected South Asian Nations is indicating an upward sloping trend between the year 2000 and 2016. Sri Lanka and India top the region with higher HDI values.

As far as the concept of ICT is concerned, a variety of indicators has been used by the researchers, policy-makers and academicians. But the current study has mainly focused on two prime indicators, i.e. Mobile cellular subscriptions and internet usage due to their comprehensive coverage and applicability in the existing literature on ICT so far.

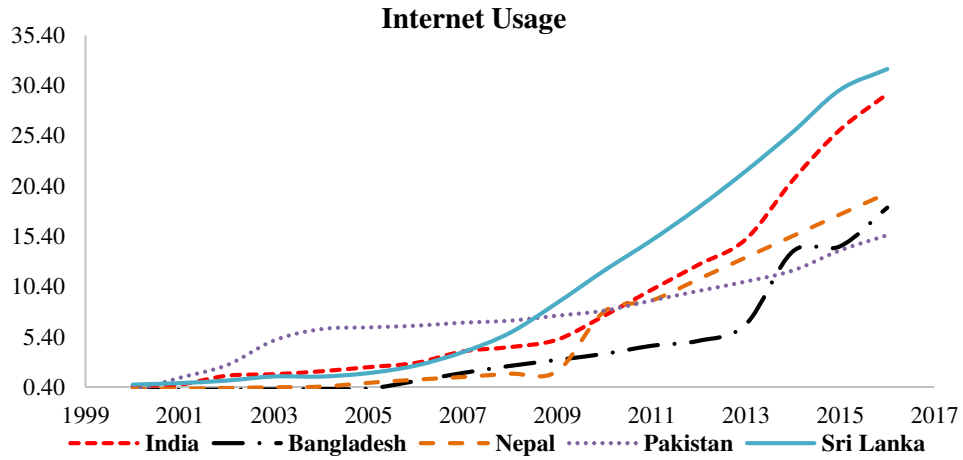
From fig-2A and fig-2B, it is quite evident that Sri Lanka is far ahead than other South Asian nations in terms of mobile telephony and internet penetration. On the contrary, Pakistan lies at the bottom in the list. As far as India, Bangladesh, and Nepal are concerned, their ICT performance remains in a constant growth trajectory.

Figure 2A Mobile Cellular Subscriptions Time Trends for South Asia



Source: Authors' representation using ITU indicators database

Figure 2B Internet Usage Time Trends for South Asia



Source: Authors' representation using ITU indicators database

ICT, Human Development, and the Digital Divide

All said and done, the digital sub-divide of developed-developing nations actually hampers the perceived potential dividends associated with ICT. The same still remains unavailable for people in the world (Shields, 2003). Though, the same cannot outweigh the ones that are truly impacted by the ICT advancement via virtual networks (Lim, 2003). Today, the digital divide is extremely appropriate to those who understand and hence value the elementary role of ICT (Guillen and Suarez, 2005).

One has to be exceptionally conscious to deal with the distributional inequalities to use and access among groups and nations while taking into account the effect of ICT on human capital as these could exert grave consequences on human capital creation. ICT could harness and nurture human capital development via information access and greater possibilities of communication. The very objective of growth is to broaden people's alternatives by the expansion of existing knowledge of

ICT (Haq, 1995; Sen, 1989; Hill, 2007). It is in this context, the current study explores the possible prime interlinkage along with the underlying theoretical perspectives between human development and ICT framework, combined with co-existing simultaneous sub-linkages with other macroeconomic factors like population growth and density and urbanization & its growth.

The rest of the paper is structured as follows. Section 2 presents the existing literature review on correlates of HDI like ICT, technological readiness, urbanization, population density, etc. Section 3 mentions the prime rationale and underlying objective of the paper. Section 4 includes the descriptive qualitative analysis and details of the data sources and selection. Section 5 entails the empirical research methodology adopted in the paper in order to establish the possible linkages between HDI and ICT tools. Section 6 encloses the key results of the empirical analysis, followed by conclusion and key policy implications in Section 7.

2. Literature Review

In light of the above background, the current paper digs deeper to investigate the existing strand of literature that associate ICT with Human Development. There is scarcity of studies that assess empirically the impact of ICT investments on human development. Majority of the studies have explored the effect of ICT on economic development so far. And whatever nominal that has been conducted, is mostly confined to developed nations with a lot more such untapped areas to be directed in the context of developing nations.

Many global institutions like World Bank, International Telecommunication Union (ITU), and International Monetary Fund (IMF) have pinpointed ICT as a powerful catalyst in the development process of emerging economies. As per a recent report by UNDP, the increasing role of ICT infrastructure in empowering human capital growth is at the priority agenda list of many ICT practitioners, policy think-tanks, and government bodies.

Theoretical Framework

It is worth discussing the theoretical background before the exisiting literature to link HDI and ICT. The contemporary theories of growth apprehends the role of IT and ITeS within the ambit of excluded goods, private goods. Infact, as per Solow (1994), creation of intellectual property rights (patents) and also different forms of compensation for technology could also be counted a private good. While the secluded kinds of IT (like monopolistic power and patents) are expressed in certain versions of economic growth and expansion, yet most of the versions especially enunciating from monopoly are found to be temporary (Uzawa, 1965). As per Romer (1990), technological advancement could be both concurrently endogenous and exogenous. In the process, some of the IT and ITeS features may prompt technology to turn out to be a public good (or service) over a period of time. The author also confirms that the technological paybacks by different nations are heterogeneous due to the presence of intercountry technological spillovers. Obviously, the same would cause disequilibrium in the processes of human and economic development to produce intercountry alterations in economic development (Verspagen, 1997).

Outcomes emanating from ICT depict the importance to determine inclusive and sustainable growth from commercial and national outlooks. It is due to the fact that these are influenced by further progress in ICT. Therefore, the vital factor that emerges from here to make relevance for ICT improvement is human capital development (depicted by individual's knowledge, expertise and skills) as per Coleman (1998). It is also proposed that ICT should not be recognized as a silver bullet of holistic growth in the absence of substantial empirical studies (Mpogole et al., 2008).

A part of existing literature entails the potential outcomes of ICT specifically in the area of inclusive growth, remarkably, in terms of: enhancing financial inclusion levels (Singh, 2012; Kirui et al., 2013); social change and developmental effects (Islama & Meadeb, 2012; Mira & Dangersfield, 2012); extenuation of urban-rural sub-divide (Chan & Jia, 2011; Qiang et al., 2011); women empowerment (Ojo et al., 2012; Maurer, 2008); better reach to health care amenities by the low economic strata of the society (Kliner et al., 2013); and opening up of potential business avenues, especially for SMEs (Asongu, 2015b; Ondiege, 2010; Mishra & Bisht, 2013).

Mostly, all the studies in this field have probed the influence of ICT investments on economic growth (Jalava and Pohjola, 2002; Daveri, 2002 and Stiroh, 2000). In general, the findings reflect the positive stimulus of ICT penetration on economic expansion in different settings across developed countries (Kuppusamy and Santhapparaj, 2005; Kim, 2008; Oulton, 2001; Wang, 1999; and Colecchia and Schreyer, 2002). Unfortunately, there are a fewer studies that explore such an association in the context of developing nations (Mbarika et al., 2005; Bolou, 2006; and Ngwenyama et al., 2006).

Bankole (et. al. 2011) study the relationship between four components of ICT infrastructure (hardware, software, telecommunication and internal spending) and three facets of human development (education, health, per capita GDP and school enrollment rates) in 51 nations classified into high-income, middle-income and low-income countries based upon their respective presence in the area of ICT across the globe over the period 1994 to 2003, deploying 3SLS regression technique. The study confirms the substantial impact of ICT investments on the standard of living, level of education and health in the sample of considered country-set, however, the impact is found to be varying across different classification of the nations.

Asongu & Roux (2016) explores the linkage between ICT and human development using a sample of 49 nations by employing instrumental variable Tobit regression in Sub-Saharan Africa (SSA) over the period 2000-2012. The study confers it by incorporating different aspects of human development such as income levels, resource-wealth, religious dominations, legal origins, etc. The key finding of the study suggests that increasing ICT penetration will enhance inclusive human development and hence will push SSA in its quest to attain sustainable development goals, (SDGs).

3. Objective and Rationale of the Paper

The two prime notions that are examined in this paper are human development and Information & Communication Technology (ICT). The study aims to provide a comprehensive overview of the role of ICT in raising human development, in the backdrop of the impact of technological

disruptions on reaching individuals across the globe. Trend analysis exhibits a much rapid growth in mobile and internet telecommunication services over the years, hence proffering the opportunities this strand of ICT development has for speeding up human capital growth. The study is an attempt to present *novel evidence* regarding the role of ICT via mobile rollout and internet usage in advancing human / intangible capital in selected South Asian countries[2] over the period 2000-16. It also investigates other numerous factors influencing the pace of human development like urbanization, technological readiness, population growth, etc. for the selected nations under study. This shall further enable to look into conceivable choices to such ICT tools to foster human development in the region.

4. Data Sources and Research Methodology

4.1.1 Descriptive Analysis

The current section conducts the preliminary analysis to understand the basic features of data behavior and validity of the sample considered with respect to the existing inter-linkages and causality relationships.

Some of the pertinent interpretations from the above tabulated values (from Table-1) are listed below for the variables that we intend to study empirically in the next section:

- Table-1 results indicate that dependent variable, HDI varies from 0.45 to 0.77 with an average value of 0.57.
- The distribution of the sample around mean values seems to vary widely. The same is supported by their average and measure of dispersion values in Table 1.
- Among the explanatory variables, mobile usage, internet penetration, urbanization growth, technological readiness index indicators depict the wide range of variations for the seclected South Asian nations over the period 2000 to 2016.

Table 1 Summary Statistics of selected variables

Variables	Obs	Mean	Std. Dev.	Min	Max
HDI	85	0.57	0.09	0.45	0.77
Mobile_sqrt	85	5.35	3.40	0.21	11.14
Internet_square	84	119.44	212.68	0.01	1027.27
FixedBroad	65	0.79	0.95	0.00	4.29
Pop_Growth	85	1.39	0.48	0.54	2.28
UrbanPop_G	85	2.76	1.19	0.47	5.99

[2] The selected South Asian nations are India, Bangladesh, Pakistan, Nepal and Sri Lanka.

TRI	50	2.87	0.35	2.21	3.46
Life_Expectancy	85	68.04	3.79	62.39	75.28
School_Enrollment	70	105.23	16.63	73.83	145.13

Source: Author's own computation on Stata 13 for selected variables for South Asian nations from the year 2000 to 2016, conducted on database extracted from UNDP, ITU indicators, WDI (the World Bank) and WEF (World Bank)

4.1.2 Cross-Correlation

This section precisely helps in understanding the degree of endogeneity existing among the selected variables. Additionally, this section helps in identifying the level of criticality of the factors for the tested variable dependence.

Table-2 displays the correlation testing outcomes on the variables taken into account for the purpose of the study. Pertinent observations that emerge out of Table-2 results are:

1. Human Development Index (HDI) is found to have a positive strong and significant relationship with mobile user subscriptions (ICT indicator), internet penetration (ITU indicator), fixed broadband subscriptions (teleinfrastructure indicator) and technological readiness index (IT & ITeS indicator).
2. Due to a mixed country set in the South Asian region, urban population growth and population growth (macroeconomic demographic indicators) are found to negatively impact the human capital development in the selected South Asian nations.
3. Other components of dependent variable (HDI) tested in Model (1) to (3) such as school enrollment (primary), per capita GDP and life expectancy are not presented in the tabulated results in Table-2 since these variables are found to have a weaker association as compared to HDI directly for the selected group of nations over the considered period.

4.2 Data Sources and Sample Selection

The data for macroeconomic demographic indicators is obtained from World Development Indicators, World Bank. International Telecommunication Union's ICT statistics have been utilized to gather data on mobile cellular subscriptions and internet usage.

Table 2 Correlation Matrix

Variables	HDI	Mobile_sqrt	Internet_sq	UrbanPop_G	Pop_G	FixedBroad	TRI
HDI	1						
Mobile_sqrt	**0.5642*** **	1					
	0.0000						

Internet_sq	**0.5035*** **	0.6461	1				
	0.0000	0.0000					
UrbanPop_G	**-0.8791*** **	-0.3166	-0.2938	1			
	0.0000	0.0016	0.0067				
Pop_Growth	**-0.7513*** **	-0.36	-0.1697	0.6292	1		
	0.0000	0.0007	0.0220	0.0000			
FixedBroad	**0.4606*** **	0.7209	0.7813	-0.1712	-0.2176	1	
	0.0001	0.0000	0.0000	0.1728	0.0817		
TRI	**0.6757*** **	0.4867	0.3056	-0.7096	-0.1116	0.3808	1
	0.0000	0.0003	0.0309	0.0000	0.4404	0.0064	

Source Authors' testing results using Stata 13 on correlation exercise on studied variables where '***' is 1% significance, '**' is 5% significance and '*' is 10% significance.

HDI data is collected from UNDP Human Development reports and reviews on qualitative indicators. Technological Readiness Development Index (TRI) database is taken from the World Economic Forum (WEF), the World Bank Global Competitiveness database (TCdata360).

The sample is purposively considered to be of selected South Asian (developing) nations in order to examine any pertinent distinction on the association among the studied variables due to differences in the stage of development that is unique for this region only. The period considered for the study is from *2000 to 2016* so as to investigate the recent reversals (if any) in case of developing nations on account of human development with positive impact due to wider ICT usage.

5. Research Methodology

In order to conduct an empirical examination of the linkage among the variables, the study has applied *fixed effects panel modeling (FE-Model)* technique on the selected country set. Fixed effects model eliminates the probable impact of time-invariant attributes so as to evaluate the net impact of the explanatory variables on the key (left-hand side) outcome variable. Each firm is distinct, therefore the firm's error term and the constant (that captures discrete properties) must not be associated with the remaining. In case; the error terms are linked, fixed effects model may

not give the true, correct and realistic inferences and the only option left is to probably use random-effects modeling. This is the key reasoning behind the Hausman[5] specification test (current empirical estimation results mentioned in the explanation section below). Additionally, cross-sectional dependence problem is automatically taken care with usage of micro (short) panel (a large number of entities with fewer years).

Econometric Model Specification

$$Y_{it} = \beta_1 X_{it} + \alpha_i + \mu_{it}$$ (Common FE Model Regression Equation)……..

Where, α_i (i= 1……n) captures the individual firm level traits via unknown intercepts of each firm, Y_{it} represents the dependent variable (DV) over time (t) and entity/ firm (i); X_{it}s is the list of independent variables (IVs) used in the model; β_1 is the regression coefficient of the respective IV and μ_{it} is the error term. Thus, it is often suggested to use panel fixed effects modeling wherever firms' individual characteristics are to be kept intact.

In order to capture the holistic view, the authors have extended the model specifications with different dependent variables. Therefore, the current paper tests the impact of ICT indicators on HDI and other components of HDI like per capita GDP, school enrollment, life expectancy in the empirical analysis results; tabulated in Table-3.

Variables used in the Econometric Model:

Dependent Variable(s): Human Development Index (HDI) represents the social cum economic growth indicator to estimate the magnitude of influence due to improvement in the standard of living and per capita income level of the people staying in the selected developing nations group. Alternatively, HDI includes a decent standard of living (given by GNI per capita), knowledge (given by expected years of schooling) and long & healthy life (with a holistic mix of qualitative and quantitative growth parameters).

The net school enrollment rate is the ratio of children of official school age who are enrolled in school to the population of the corresponding official school age.

Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.

Independent Variable(s): The key IVs are Information & Communication Technology (ICT) indicators, i.e. mobile phone penetration, fixed broadband usage and internet usage per 100 inhabitants denoted by $X_{it.}$

The technological readiness index pillar of GCI encapsulates this competence via components on the latest techniques availability, technology absorption at firm-level, tech transfer and FDI, etc. The index takes into account the innovation capacity as well.

The annual population growth rate for year t is the exponential rate of growth of midyear population from year 't-1' to 't', expressed as a percentage. The population is based on the de facto definition of population, which counts all residents regardless of legal status or

citizenship. Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects.

6. Empirical Analysis and Results

Table-3 includes the panel regression results of empirical testing on selected South Asian nations dataset over the period from the year 2000 to 2016 as per trailing regression equation:

$$HDI_{it} = \alpha + \beta_1(Mobile\_sqrt_{it}) + \beta_2(Internet\_sq_{it}) + \beta_3(Pop\_growth_{it}) + \beta_4(UrbanPop\_G_{it}) + \beta_5(FixedBroad_{it}) + \beta_6(TRI_{it}) + \varepsilon_{it}$$

$$Per\_Cap\_GDP_{it} = \alpha + \beta_1(Mobile\_sqrt_{it}) + \beta_2(Internet\_sq_{it}) + \beta_3(Pop\_growth_{it}) + \beta_4(UrbanPop\_G_{it}) + \beta_5(FixedBroad_{it}) + \beta_6(TRI_{it}) + \varepsilon_{it}$$

$$School\_Enrol_{it} = \alpha + \beta_1(Mobile\_sqrt_{it}) + \beta_2(Internet\_sq_{it}) + \beta_3(Pop\_growth_{it}) + \beta_4(UrbanPop\_G_{it}) + \beta_5(FixedBroad_{it}) + \beta_6(TRI_{it}) + \varepsilon_{it}$$

$$Life\_Expect_{it} = \alpha + \beta_1(Mobile\_sqrt_{it}) + \beta_2(Internet\_sq_{it}) + \beta_3(Pop\_growth_{it}) + \beta_4(UrbanPop\_G_{it}) + \beta_5(FixedBroad_{it}) + \beta_6(TRI_{it}) + \varepsilon_{it}$$

We have run several different specifications of the regression equations, however, the significant key results are listed here in Table-3. To correct the panel's heteroscedasticity drawback, the robust standard errors estimates are considered. Although FE panel modeling takes care of the multicollinearity problem, it is advisable to check the multicollinearity (VIF <10) for the variables of key interest. Table-3 encapsulates the key findings of the empirical regression analysis. To conduct the regression on the selected panel dataset, we have utilized STATA 13.0 MP for regression coefficients computation.

Table 3 FE Regression Results

Selected South Asian Nations Panel Results						
Dependent Variable	**Per Cap GDP**	**Life_Expec**	**Sch_Enro_Rate**	**HDI**	**HDI**	**HDI**
Control Variables	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***	***(6)***
Mobile_Sqrt	2.4323**	0.5921***	0.5416*	0.0111***	0.0089***	0.0089***
	(1.7906)	(0.0580)	(0.3474)	(0.0011)	(0.0011)	(0.0012)
Internet_Sq	1.1962***	0.0001*	0.0047**	0.0001**	0.0005*	0.0001*
	(0.1021)	(0.0004)	(0.0023)	(0.0008)	(0.0007)	(0.0008)
	-1.7751	-1.0119**	-0.1348	-0.0319***	-0.0343***	

Population Growth	(1.9968)	(0.5419)	(0.8130)	(0.0119)	(0.0096)	
Urban Population Growth						-0.0216*** (0.0068)
Fixed Broad Band_sq					0.0168*** (0.0044)	0.0133*** (0.0045)
TRI	4.6442*** (1.0738)	1.0008* (0.4163)	6.8692** (1.1218)	0.0139** (0.0181)	0.0171** (0.0077)	0.0181** (0.0079)
Constant	5.9697** (2.9147)	8.7967** (0.9813)	7.6914** (1.2570)	0.5822*** (0.0405)	0.6007*** (0.0189)	0.6183 (0.0221)
R-square	0.7011	0.5775	0.6214	0.5741	53.4211	0.8333
F-Stats	74.14	76.46	72.98	87.85	96.43	91.21
Probability	0	0	0	0	0	0
rho	0.9843	0.9846	0.9692	0.9949	0.9926	0.9886
No of Obs.	50	50	44	50	50	50
No of Groups	5	5	5	5	5	5

Source Author's regression results based on FE modeling using STATA 13 testing.

1. *** signifies 1%, ** 5% and * 10% level of significance ($^{***}\ p < 0.01$, $^{**}\ p < 0.05$, $^{*}\ p < 0.1$).
2. Standard errors in parentheses.

Although R-square is found to be as low as nine percent in some of the initial basic regression models listed in Table-3, the same is reasonable with the large heterogeneous panel of firms considered in the sample. The F statistics and the DW test statistics have turned out to be highly significant. The specification tests under regression diagnostics (post-estimation testing), especially testing for heteroscedasticity (hettest & szroeter) and serial correlation (xtserial) are found to confirm the presence of strong homoscedasticity for DV (dependent variable) series and no auto serial correlation among IV (independent variable) series.

From Table-3, the following pertinent observations could be noted:

- ✓ All ICT infrastructure indicators, fixed broadband, and mobile subscriptions, and internet penetration are found to impact positively and significantly all the key dependent variable, HDI and its components like net school enrollment rate, birth life expectancy and per capita GDP (Model 1 to 6). Along all the indicators of HDI, ICT variables seem to mark a prominent dent upon widely accepted economic growth measure, GDP per capita. The same corroborates with the existing studies that have propagated that ICT has a crucial role to determine the prospective

human capital development, especially in the context of developing nations (Hettiarachchi, 2006; Bankole et al. 2011).

- ✓ Population growth, annual (in %) and urban population growth (in %) are found to impact HDI significantly and negatively (Model 4 to 6). Instead, these demographic macroeconomic variables for selected developing South Asian nations are adversely influencing rather hampering the path of creation of skilled manpower (resources) in these nations (Hettiarachchi, 2006).
- ✓ Another global competitiveness indicator, technological readiness is found to impact the coefficient of HDI (and other dependent variables tested) positively and significantly (Model 1 to 6). This indicates that the adaptation and availability of basic infrastructure in the selected group of developing nations are mandatory pre-conditions for having a positive contribution of technological advancement in the human capital creation of these countries.

7. Conclusion and Policy Implications

Undoubtedly so far, ICT tools have proved crucial and advantageous for the developing regions, South Asia in particular. The historical pieces of evidence have vested in high hopes of the relevance of such technologies, despite prevailing usage of the same are not essentially determined towards human capital development. Formulating different notions to explore the influence of ICT investments on human capital creation, delivers a contemporary outline to comprehend how nations could best invest in ICT for advancement. The empirical analysis has exhibited the distinguishing effect of ICT usage on human capital development in developing economies. By selecting only the highly significant results ($p < 0.01, 0.05$), the key inferences relevant to the selected South Asian countries of this paper are revealed. The prime detection from the current paper indicates that the ICT penetration is of substantial relevance to impact the (increased level) standard of living and also the education level across the globe.

There is an urgent need to change the entire paradoxical thinking about ICT in order to ensure the effective use of ICT in human capital creation in SAR. The same shall include the complete transformation from rethinking of fruitful government policies, integration of ICT policies with broader economic and social goals, and of course, active participation of residents.

In developing nations (as per empirical analysis results in Section 6), the importance of ICT can't be denied on the level of education and standard of living. For developing nations like South Asia, the impact of ICT on human capital creation is more obvious. Measures like health and education in the HDI are possibly more suitable for these nations. Most of the current shreds of evidence indicate that these nations are still attempting to enrich elementary education (primary school enrolments and literacy rates), and health (life expectancy). These nations shall consequently undertake conscientious investments in manpower and skill enhancement in their ICT financing policies so as to fully exploit the effect of such investments in the domain of human capital creation.

Moreover, the study recommends that for holistic human development, we need to focus not only on the supply-side parameters of ICT, but also on their demand-side aspects like its access,

characteristics and types of users, its content, its applicability, etc. The demand-side facet of ICT needs a special emphasis to properly encapsulate the diffusion of technology across different socio-economic segments of any nation, which would further enable quantification of substantial digital divides.

End Notes:

[1] a public-private partnership of Accenture, the Markle Foundation and the United Nations Development Programme (UNDP).
[2] It primarily comprises three broad indices – education index, income index, and life expectancy index.
[3] United Nations Development Programme.
[4] Available at http://data.un.org/ (Accessed on: 21st May 2019).
[5] Due to the poor properties of Hausman test empirically, it often fails to provide practical results in general.

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