Association for Information Systems
AIS Electronic Library (AISeL)

MWAIS 2007 Proceedings | Midwest (MWAIS)

December 2007

HUMAN DEVELOPMENT THROUGH INFORMATION & COMMUNICATION TECHNOLOGIES: THEORETICAL & EMPIRICAL SUPPORT

Mehruz Kamal
University of Nebraska Omaha

Chi Zhang
University of Nebraska Omaha

Lotfollah Najjar
University of Nebraska Omaha

Sajda Qureshi
University of Nebraska Omaha

HUMAN DEVELOPMENT THROUGH INFORMATION & COMMUNICATION TECHNOLOGIES: THEORETICAL & EMPIRICAL SUPPORT

Mehruz Kamal
University of Nebraska Omaha
mkamal@mail.unomaha.edu

Chi Zhang
University of Nebraska Omaha

Lotfollah Najjar
University of Nebraska Omaha

Sajda Qureshi
University of Nebraska Omaha

ABSTRACT

Information and Communication Technologies (ICTs) have been shown to have an impact on social, economic and human development. Prior studies conducted have investigated the relationships between ICT and development but there has been a consistent lack in the development literature in tying the findings of such studies to theory. In this paper, we marry an empirical analysis to a theoretical framework to examine the nature of the relationship between ICTs and human development and reveal that a positive correlation exists between the two.

KEYWORDS

Human Development, Information and Communication Technology (ICT), Information Technology (IT) for Development

INTRODUCTION

With increasing globalization, countries all over the world are eager to engage in activities that would promote their chances of participating in the global economy. In attempting to do so, countries are recognizing the important role that Information Technology (IT) can play in bringing about positive cycles of development. Steinberg (2003) states that Information and Communication Technologies (ICTs) can serve as potentially powerful mechanisms when used appropriately towards development strategies. Information and communication technologies may be defined as "electronic means of capturing, processing, storing, and disseminating information" (Feng & Yuan 2006). Steinberg (2003) points out that there are three main ways in which development activities can benefit from the power of ICTs. They are: 1) ICTs can enable the sharing of ideas and experiences of the most isolated people, 2) ICTs can help bring healthcare through telemedicine and education through distance learning mechanisms to under-

privileged communities, and 3) effective use of ICTs can boost productivity of firms in developing countries and lead to improved economic growth.

According to the United Nations Development Programme (UNDP) and its Human Development Reports (HDRs), it is mentioned that globalization has been primarily talked about in terms of both markets and states, but rarely in terms of its impact on people. The reports emphasize that the settings of conditions serving the objective of human development should be considered. UNDP defines human development as "[. . .] creating an environment in which people can develop their full potential and lead productive, creative lives in accord with their needs and interests." This definition implies that human development is about creating choices and capabilities for individuals and according to the UNDP, such choices come in the form of basic capabilities of leading long and healthy lives, being knowledgeable, having access to the resources needed for a decent standard of living, and being able to participate in the life of the community. Prior research in this area indicates that ICTs can be used to advance human development goals. The use of ICT is also expected to fundamentally impact labor productivity, growth and employment. The penetration of ICT into activities outside of production is expected to "reshape the way we work, markets and leisure will be organized and the way in which individuals and communities can trade and access information and services, leading to changes in the structure of markets, improvements in the quality of life, a deepening of democracy and major advances in terms of human development indicators. (Chandrasekhar & Ghosh 2003). The focus in this paper is thus on human development—not downplaying the importance of either social or economic development—on the basis that the impacts of ICT implementations can be more distinctly noticeable at the micro-level of human development. In helping to bring an enabling environment to individuals in underserved, underprivileged communities, we look to see how ICTs may enhance the set of capabilities that these communities of people may potentially achieve. In concert with this goal, we hope to address the following research question: *How does Information & Communication Technology (ICT) affect Human Development?* The main contribution of this study lies in the discovery of the underlying nature of the relationship between ICTs and human development through statistical analysis that is based on a theoretical model.

HUMAN DEVELOPMENT & INFORMATION TECHNOLOGY

Extant literature has revealed that there is a connection between IT and development. Both social as well as economic development can be impacted through the injection of some form of IT (Duncombe & Heeks 2002; Puri & Sahay 2003). Back in 2001, the UNDP argued in its annual HDR that IT and biotechnology are vital tools in the fight against world poverty. The report pointed out that ICT can make an important development impact. Wright (2006) reports that ICTs can address many of the development issues that Africa faces, provided access to those technologies is available. Warschauer (2003) provides a different perspective altogether by stating that "[t]echnology does not exist as an external variable to be injected from the outside to bring about certain results. It is woven into social systems and processes." Warschauer (2003) highlights that technology should not become an end in itself but rather shoud be a means to help achieve community goals.

There have been some studies that have looked at specific relationships between human development and ICTs. Birdsall and Birdsall (2005) conducted a statistical analysis on the Human Development Index (HDI) and the Digital Access Index (DAI) and found that they both have a strong correlation to one another. They also revealed that a spatial component plays a role in determining the actual direction of the relationship between the two indices. Their results indicate that improvements in human development may possibly drive technological advances, and not the other way around as asserted by so many early researchers in this area. Although this study found a significant relationship between human development and digital access, there was no evidence of the study's findings being related to any derivation of relevant theories. In another study, Hill and Dhanda (2003) looked at the HDI and the Technology Achievement Index (TAI) and found that there was a strong correlation as well as a reciprocal

relationship between the two. In other words their results implied that advances in technology brought about human capabilities through efficient processes in the dissemination of progress in medicine, communications, agriculture, energy, and manufacturing. In addition, the reverse relationship was also supported wherein betterment of human capabilities in education, income, health, and political freedom stimulated the creation of knowledge necessary for rapid technological change. The study provided empirical results with no ties to underlying theories.

In a UNDP report, *Promoting ICT for Human Development in Asia* (2004), it was highlighted that in order for developing countries to achieve improvement in human development by sustaining the benefits obtained from ICT implementations, various stakeholders (governments, civil society organizations, the private sector, and individuals) need to commit and mobilize resources. A study by Salvador, Sherry, and Urrutia (2005) showed the setting up of telecenters and cyber cafes in developing countries helped increase access to knowledge and information. The telecenters created an enabling environment that assisted the people in the surrounding community to reach out to a wider spectrum of capabilities. In the same vein, a study by Cecchini and Scott (2003) showed how implementation of IT infrastructures in healthcare provision in rural India can bring about improved human development. As evidenced from existing prior literature, there is a link between human development and ICTs. But the exact nature of this connection is yet to be established—and most importantly all prior studies in this area have the common shortcoming of a failure to ground their findings to a theoretical model. In this study we hope to address this very gap whereby we investigate the underlying effects that ICTs may have on human development that is firmly tied to a theoretical framework.

THEORETICAL FRAMEWORK

Qureshi (2005), in an interpretive study of multiple cases, investigated the relationships that might be in play as we talk about IT and its impact on development. The study, based on Schumpeter's theory of economic development, revealed that a cyclical relationship evolves among the entities involved. Qureshi (2005) points out that positive cycles of development come about when the effects from ICT implementations, with the help of better tools and techniques, will result in increased human development as well as improved macro-economic growth. It is seen that this also results in increased per capita income, which then creates a ripple effect for improved social and economic development. Qureshi's (2005) proposed model is shown in Figure 1 below. The IT for development model is a first attempt at tying together economic concepts with IT. The model provides a helpful mechanism to conceptualize and visualize how the various components of development that are so widely discussed in this field tie in with one another. The depth of the model comes from not only explaining positive cycles of development but also the possibility of a negative cycle of development wherein inappropriate uses and implementations of technology may give rise to bottlenecks for communities. And so, being aware that development can come in terms of both positive and negative cycles, there is a dire need to ascertain the exact directionality of the relationships among the entities in the IT for Development model (Qureshi 2005). We ground our work in this study on the model of IT for Development and narrow in on our focus on investigating the relationship between how providing access to information and expertise impacts human development. In line with the focus of this study then, we hope to test the following hypothesis: *Access to information and expertise positively impacts human development.*

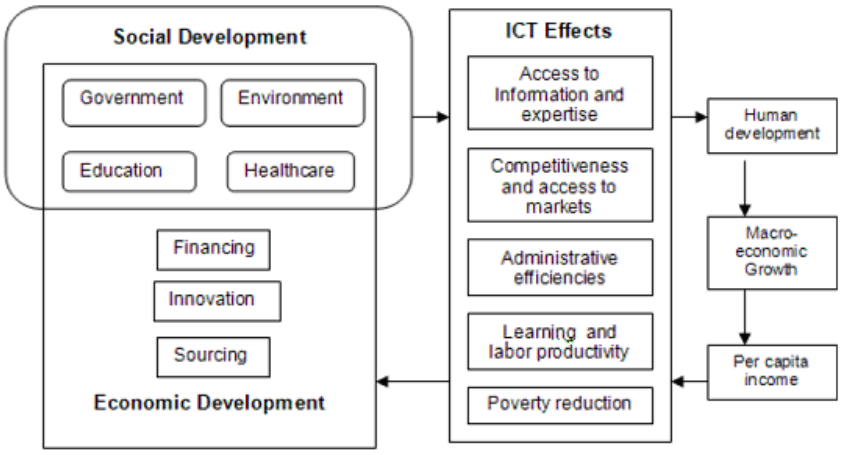

Figure 1. Model of IT for Development (Qureshi 2005)

METHODOLOGY

Indicator Selection

In working towards testing our hypothesis, we have collected data from the latest release of the HDR 2006. The UNDP supervises the gathering and compilation of data in the HDR. Human development in HDR is measured through the Human Development Index (HDI)[1] and is defined as, "A composite index measuring average achievement in three basic dimensions of human development—a long and healthy life, knowledge and a decent standard of living."

There have been a good number of studies conducted by development agencies that have used varying indicators to measure ICT access. The frustrating struggle of incomparable country-level data and formulation of composite country-level statistics has been plaguing the development community for a very long time. Initiatives to come up with a common set of criteria to measure access to ICTs in countries were then adopted by the leading development agencies at the WSIS Thematic Meeting on Measuring the Information Society (Geneva February 2005). The initiatives were then formulated into a publication by the World Bank, *Core ICT Indicators* (World Bank 2005)[2]. The report lists the following core indicators for measuring ICT infrastructure and access: Fixed telephone lines, mobile cellular subscribers, computers, Internet subscribers, broadband Internet subscribers, international Internet bandwidth, percentage of population covered by mobile cellular telephony, internet access tariffs in US dollars and as a percentage of *per capita* income, mobile cellular tariffs in US dollars, and as a percentage of *per capita* income, and percentage of localities with public internet access centres (PIACs) by number of inhabitants (rural/urban). Due to the recent publication of the World Bank report, *Core ICT Indicators*, the data for all of the aforementioned indicators were not available. We were therefore limited to the use of a subset of three indicators for which data were available: 1) Telephone mainlines (per 1000 people), 2) Internet users (per 1000 people), and 3) cellular subscribers (per 1000 people). Data for these three indicators were then obtained from the HDR to measure access to information and expertise. We further show in our analysis that this restricted set of three indicators together are a good representation of the construct of access to information and expertise.

[1] For a more detailed description on the HDI, please see http://hdr.undp.org/hdr2006/.
[2] For in-depth descriptions on the methodology used and definitions of the indicators please see http://www.itu.int/ITU-D/ict/partnership/material/CoreICTIndicators.pdf.

Data Collection

Data on 177 countries were obtained from the HDR 2006. On screening the data, it was seen that data for 43 countries was not complete. These 43 countries were then dropped from the analysis leaving us with a sample data size of 134 countries. In line with our research question and hypothesis, our dependent variable is HDI and the independent variable is Access to Information/Expertise (ATI). In order to determine the relationship between HDI and ATI, regression analysis was conducted using SPSS 14.0.

ANALYSIS AND DISCUSSION

Statistical analysis supports our hypothesis that there is a significant positive correlation between the constructs, access to information and expertise and human development. In other words, increased access to information and expertise through ICT implementations will bring about enhanced enabling capabilities and thus human development for individuals and communities. Table 1 shows the descriptive statistics of Telephone Mainlines, Cellular Subscribers, Internet Users, and HDI. It gives the means, & standard deviations of each.

Table 2 shows the correlations among telephone mainlines, cellular subscribers and Internet users. A high value of Cronbach α (0.912) was obtained, indicating that all three indicators load well and are good representatives of ATI and expertise. Regression analysis showed a significant correlation coefficient between HDI and ATI ($r = 0.829$).

	Mean	*Std. Deviation*	*N*
HDI	.73440	.171676	134
Phone line	211.36	195.350	134
Cell	407.27	346.167	134
Internet	188.63	208.939	134

Table 1. Descriptive Statistics

The ANOVA results show that ATI is significant at any level of α (*p*-value is 0.00). Table 3 indicates that HDI and ATI are positively correlated as all the coefficients in the regression equation are positive. Figure 2 gives a visual representation of this positive relationship.

	Phone line	*Cell*	*Internet*
Phone line	1.000	.861	.885
Cell	.861	1.000	.858
Internet	.885	.858	1.000

Table 2. Correlations Among Telephone Mainlines, Cellular Subscribers and Internet Users

Model	*Unstandardized Coefficients*		*Standardized Coefficients*	*T*	*Sig.*
	B	Std. Error	Beta		

1	(Constant)	.574	.013		45.674	.000
	ATI	.001	.000	.829	17.001	.000

Table 3. Model Summary

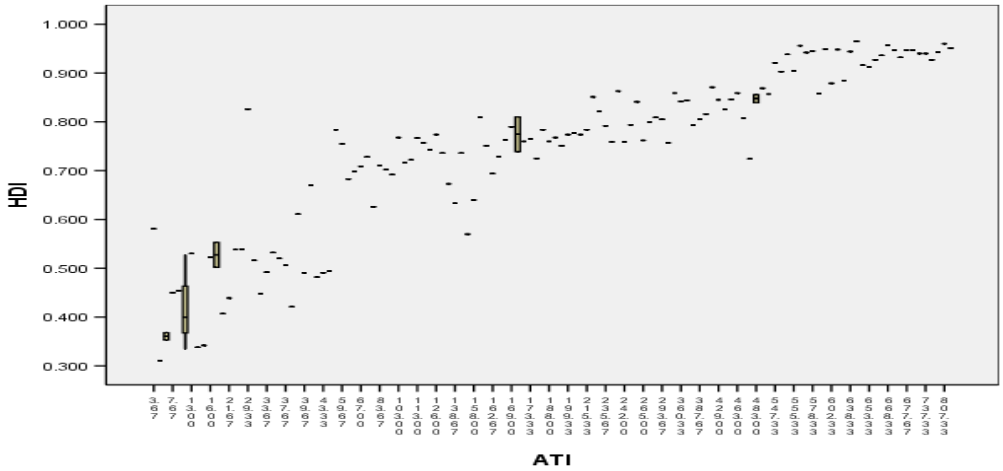

Figure 2. Correlation graph between HDI and ATI

The results not only provide empirical support but most importantly serve to validate the proposed relationship among these two components in Qureshi's (2005) model of IT for Development. Our findings support the idea of positive cycles of development whereby improved access to information through the use of emerging innovative technologies, such as mobile phones, telecenters, and the Internet, will provide enhanced capabilities to underprivileged communities. Such capabilities will then create an environment where people can develop their full potential and live productive and creative lives—serving the basic premise for human development. Enhanced human development may then impact macro economic growth and per capita income, and subsequently lead to both economic as well as social development. The exact nature of these impacts warrants investigation.

CONCLUSION

Studies on ICTs and their impact on human development have been researched from various perspectives. But what has been consistently lacking is a theoretical basis for understanding the results of prior studies. Our study in this paper uses a model of IT for Development to hypothesize a relationship among two very important factors in the development literature—human development and access to information and expertise through ICTs. Our results reveal a significant positive correlation between the two. Future research will entail the gathering of data on the full range of core ICT indicators as outlined in the *Core ICT Indicators* (World Bank 2005) report. In addition, our research focus will also be directed towards the other theoretical constructs in the model of IT for Development to provide empirical validation of the hypothesized relationships amongst them and to further refine the model.

REFERENCES

Birdsall, S. A., and Birdsall, W. F. "Geography Matters: Mapping Human Development and Digital Access," *First Monday* (10:10), 2005.

Cecchini, S., and Scott, C. “Can Information and Communications Technology Applications Contribute to Poverty Reduction? Lessons from Rural India,” *Information Technology for Development* (10:2), 2003, pp. 73–85.

Chandrasekhar, C.P. & Ghosh, J. “ICT and Development: The Connectivity Barrier,” *Business Line Internet Edition*, June 3, 2003, http://www.thehindubusinessline.com/2003/06/03/stories/ 2003060300160900.htm.

Duncombe, R. ,and Heeks. R. “Enterprise Across the Digital Divide: Information Systems and Rural Microenterprise in Botswana,” *Journal of International Development***,** (14:1), 2002, pp. 61–74.

Feng, C., and Yuan, C. "The Impact of Information and Communication Technologies on Logistics Management," *International Journal of Management*, Poole, (23:4), December 2006, p. 909.

Hill, R. P., & Dhanda, K. K. "Technological Achievement and Human Development: A View from the United Nations Development Program," *Human Rights Quarterly* (25), 2003, pp. 1020–1034.

Pohjola, M. "The New Economy in Growth and Development," *Oxford Review of Economic Policy*, 2002.

Puri, S. K.; Sahay, S. “Participation through Communicative Action: A Case Study of GIS for Addressing Land/Water Development in India,” *Information Technology for Development* (10:3), 2003, p. 179–200.

Salvador, T., Sherry, J., and Urrutia, A. “Less Cyber, More Café: Enhancing Existing Small Businesses Across the Digital Divide with ICTs,” *Information Technology for Development.*(11:1), 2005.

Steinberg, J. “Information Technology and Development Beyond Either/Or,” *The Brookings Review* (21:2), 2003, pp. 45–48.

Qureshi, S. “How does Information Technology Effect Development? Integrating Theory & Practice into a Process Model,” *Proceedings of the Eleventh Americas Conference on Information Systems*, Omaha, NE, 2005.

UNDP, Human Development Report 2001, http://hdr.undp.org/reports/global/2001/en/.

Warschauer, M. “Demystifying the Digital Divide,” *Scientific American*, August 2003, pp. 42–27.

Wright, B. “The Role of ICT in African Development,” *African Business*, London, November 2006, p. 56.