

Enhancing Knowledge Discovery and Innovation in the Digital Era

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Chapter 2

An Innovation–Based and Sustainable Knowledge Society: The Triple Helix Approach

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ABSTRACT

Innovation is a key source of new products, benefit and fresh growth in revenues. In developed economies, the private sector is the engine of innovation and growth, accounting for between half and two-thirds of total spending on research and development in some countries. On the other hand, increasing access to technology will be a critical driver of economic growth in emerging economies, but it will require private sector leaders and the public sector to work together to make their respective programs more impactful. At the same time, the rapid advances and pervasive diffusion of information and communication technology (ICT), combined with the growth of the Internet have led to deep transformations in economic, social and institutional structures. ICT applications affect the performance of businesses and the efficiency of markets, foster the empowerment of citizens and communities as well as their access to knowledge, and contribute to strengthening and redefining governance processes at all institutional levels.

1. INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Numerous studies have focused on the direct contribution of ICT to socioeconomic development and, while their findings and conclusions vary according to the context and application, there is an overall agreement that access to information and its transformation into knowledge can augment production processes, increase income potential, and improve the living conditions of the poor. ICT is an effective tool that, when supplemented by investments in connectivity and other factors such as innovation, education, health and infrastructure, increases competitiveness and contributes to economic growth, social development and poverty reduction.

ICT solutions can facilitate the participation of lower income populations in the development process by directly tackling relevant aspects, which precisely hinder their integration into social and economic

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development. In particular: (a) limited knowledge and literacy which impairs access to skills and jobs (education); (b) poor health and sanitary conditions limiting employability and risk-taking attitudes (health); (c) active involvement in civic life and strengthening of democratic process; and (d) economic opportunities.

In this respect, the evolution of modern ICT brings about concrete opportunities for enhanced provision of social services and poverty reduction through, among others, distance education and telemedicine solutions, connectivity, and strengthened and more transparent government operations (i.e. e-government). It also provides for the modernization and expansion of the micro-finance sector to effectively reach marginalized and less favored populations through effective technology-based solutions and innovative financial services and, thereby, creating economic opportunities at the local level.

Inequalities in access to education--especially high-quality education that prepares young people for employment opportunities in an inclusive knowledge society and to become active citizens in complex, market-driven, democratic societies--are a critical barrier to reducing poverty and increasing economic growth. Near-universal access to the Internet via low-cost networks enables teacher training, enhances student access to traditional teaching materials via Internet distribution, and allows the introduction and use of new and advanced multi-media resources and learning tools. The young generation takes readily to computers and such resources, and there is evidence that classroom access to ICT tools can improve learning and help motivate students to stay in school. At the same time, there is evidence that informal learning outside the classroom is strongly enhanced by affordable access to the Internet. This informal learning is driven, in part, by the growing availability of information on the Internet and the increasing organization of such information by search engines, but also by the growing use of interactive systems--from "chat" systems to e-mail and text-messaging to web logs and other interactive web-based systems--.

The improvement in the delivery of health care services in geographically remote and rural areas is one of the most promising and clearly demonstrated applications of ICT in social development. In particular, ICT is being used in many developing countries and communities to facilitate: (a) remote consultation, diagnosis and treatment through the use of digital cameras to download images onto a computer and transfer them to doctors in nearby towns; (b) collaboration and information exchange among physicians; (c) ICT-based medical research through the use a network of satellites and ground stations to submit data for clinical trials; (d) medical training through ICT-enabled delivery mechanisms; and (e) access to centralized data repositories connected to ICT networks that enable remote healthcare professionals to keep abreast of medical knowledge. Moreover, the Internet is an effective means to disseminate public health messages and disease prevention techniques in developing countries. It also enables better monitoring and response mechanisms. Also, ICT is helping improve the efficiency of public health systems and medical facilities by, for example, streamlining medical procurement or creating and managing patient records.

ICT tools can drive down transactions costs for financial services such as microfinance and a widening range of banking, insurance, and other services for low-income groups, particularly as their delivery expands beyond nonprofit groups and becomes more widespread. For example, the expanded use of ICT and the Internet can reduce the transaction costs of remittances in a way that brings higher social benefits for all parties involved in these transactions. Moreover, ICT technology offers several approaches to expanding access to electronic transactions and banking services via remote transaction devices for microfinance that work over mobile phone networks; smart cards that can store account balances, transaction histories, and positive IDs such as a fingerprints. The next generation of mobile

phones may be capable of conducting transactions automatically via very short-range radio, potentially turning phones into electronic wallets.

Largely for reasons of cost, most rural communities and many low-income urban communities lack effective and affordable local phone systems, whereas a low-cost local phone system can make universal access a reality in many communities. The technological potential to solve the problem has now emerged via local Wireless Fidelity Networks (WiFi) and Voice-Over-Internet (VOIP) telephony using peer-to-peer systems that enable access to a great variety of Internet services and information via a computer or other converged device. Voice-driven or voice-accessible services -especially if also made available in indigenous languages- can help overcoming literacy and computer skill barriers. Other benefits also include ending rural isolation, enhanced family solidarity, increased access to information and services, improved ability to find employment and, at a community level, higher economic capacity and productivity and wider citizen participation in democratic processes.

A recent study by the London Business School found that, in a typical developing country, an increase of ten mobile phones per 100 people boosts GDP growth by 0.6 percentage points. The study concludes that wireless solutions are concrete examples of “technologies that help people help themselves.”

It becomes clear that the poor can benefit from the effective deployment of ICT and the development of a knowledge economy when such interventions match the local conditions and meet the following four requirements. First, promote a multi-stakeholder partnership framework delineating the effective participation of the public sector and civil society, while creating the incentives for socially responsible private investment. Second, strengthen the provision of ICT-based public social services and promote social inclusion, while maintaining the role of the private sector as the main source of innovation. Third, stimulate macroeconomic growth by facilitating access to knowledge and information through increased connectivity and appropriate ICT solutions for marginalized and lower-income populations, thereby tapping a strong market potential. And fourth, design and adopt long-term ICT investment frameworks in human development (i.e. education, health and environment), along with the design and implementation of cost-effective technologies aimed at increasing the market access, efficiency and competitiveness of the poor (connectivity, knowledge centers, etc.).

As all major and wide-ranging technological advances, the ICT revolution is at the same time creating enormous opportunities and posing daunting challenges. On one hand, it has the potential to increase productivity and wealth, generate new activities, products and services, and improve the well being of the population, notably in regard to education, government and health levels. On the other hand, the uneven distribution of such opportunities can lead to further alienation of marginalized communities and an exacerbation of existing socioeconomic inequalities. Thereby, a balanced access and effective use of ICT tools and networks in the new global knowledge economy, along with an integrated process of technological innovation are critical for reducing poverty, increasing social inclusion and improving living conditions for all.

The “digital divide” (a phrase coined in the 1990s) described the perceived growing gap between those who have access to and the skills to use information and communication technologies and those who, for socioeconomic and/or geographical reasons, have limited or no access. In particular, it is used to raise the concern that the emergence of ICT could exacerbate existing inequalities in the access to information and that, thereby, certain groups could face additional disadvantages because of their geographic location, age, gender, culture, and social and economic status, among others. Moreover, the phrase reflects

the prevalence of socioeconomic and structural inequalities at the regional, national and local levels, which are characterized by insufficient infrastructure, relatively high access costs, inappropriate or weak policy regimes, inefficiencies in the provision of telecommunication networks and services, lack of local content, and uneven ability to derive economic and social benefits from information-intensive activities.

The United Nations Millennium Declaration notes that efforts to make access available to all and harness the power of ICT can contribute toward the achievement of the Millennium Development Goals (MDGs) by 2020 now replaced by the SDGs, thereby creating “digital opportunities” in development.

Yet, these opportunities cannot be effectively and fully realized if left to market forces alone, and require the active participation of the public, private and civil society sectors under integrated efforts towards the development of an inclusive knowledge society. This is where a Triple Helix approach can be more beneficial; in fact, a model of knowledge society, is one that the results from the convergence and crossing-over of three worlds which were previously separated: public research, business and governments; this convergence also represents the Triple Helix model. This model refers to a spiral model of innovation that captures multiple reciprocal relationships among institutional settings (public, private and academic) at different stages in the capitalization of knowledge.

2. FOSTERING SUSTAINABLE DEVELOPMENT THROUGH ICT

The evolution of modern ICT within the broader scheme of a knowledge society, brings about concrete opportunities for enhanced provision of social services and inclusion and poverty reduction through, among others, strengthened and more transparent government operations, distance education, telemedicine and e-governance solutions. It also provides for the modernization and expansion of the micro-finance sector to effectively reach marginalized and less favored populations through effective technology-based solutions and innovative financial services and, thereby, creating economic opportunities at the local level triggering a knowledge economy.

In the past years in the developing countries many experiences have already been implemented that address the problems mentioned above, although most often they have been limited to local level without reaching a complete national or even regional coverage. This rises the problem of how to spread the benefits of ICT based development programs within and across the countries and how coordinated ICT based development programs can be implemented across different countries to foster development goals at the regional level, in order to facilitate south-south cooperation.

In this paper we address both problems by proposing to share and implement at the regional level, an action-oriented strategy based on four pillars:

- ICT and education
- ICT and health
- ICT and government services
- ICT and financial services

This paper refers to concrete examples of pilot and investment initiatives concerning the pillars above, as well as to similar experiences from other regions of the world, that are showing the ICT’s favorable support to the social and economic growth of the developing regions.

Pillar 1: ICT and Education

Over the past years, three parallel ICT revolutions have begun to transform educational quality for the majority of children in the developing countries.

First and most important was near universal access to the Internet for every school, catalyzed in large part by efforts to extend wireless networks to low-income urban neighborhoods and even remote rural locations, and with the concrete effort to encourage extensive teacher training in computer-based instruction, and to support new curricula development (see (Barbosa 2010) for the case of the Brazilian schools). Under a policy reform that allowed “social use” exemptions from telecom monopolies in low-income communities, many of the schools also functioned as WiFi “hotspots” for community access as well (Mace 2007; Bhaskaran 2004; Hosman 2010), providing low-cost voice-over-Internet phone service and access to local-language voice-based e-government services (Heimer and Brewer 2010; Ho, Smyth, Karm and Dearden 2009).

Second, Universal access and teacher training allowed new curricula to benefit from the “Google” revolution of rapidly-expanding:

- Free knowledge resources on the Internet;
- New software tools to enable trusted networks of approved educational resources;
- Interactive discussions among students across a Region that created a more active and participatory learning environment;
- New multimedia courseware resources that engaged student interest.

Third, inexpensive technologies, like those described in (Brewer et al. 2005), introduced by pilot initiatives, began to make the new knowledge resources affordable to schools. These included less-expensive computers, although the goal of a computer for every child was far from being met, but more importantly included inexpensive screens for classroom displays, low-cost projectors to display information even on school walls, and inexpensive i-Pad-like hand-held devices that allowed classroom student access to knowledge and multi-media lessons (Patra et al. 2007; Vota 2010).

ICT innovations outside the school also had a marked impact on education. The proliferation of very low-cost solar-powered LED lighting made it possible for many low-income families to benefit from more productive use of evenings and for students to read and do homework (Bhusal et al. 2007). This transformation was driven by private-sector investments and innovative financing schemes, but public-private partnerships in addition to the implementation of pilot and demonstrative projects speeded their adoption by the countries of the Region. Additionally, the encouragement of reduced import duties and local manufacturing capacity speeded such process. Likewise, broadened access to communications and information via the community hotspots and inexpensive WiFi phones improved productivity and job creation in low-income communities, raising family incomes and enabling more children to stay in school.

LAC Governments, invested heavily in on-line as well as voice-accessible information tools in local languages, borrowing on global best practices for disseminating public health information, weather and agricultural extension services, disaster warnings and relief information, and a wide array of government services (World Bank 2004; UNESCO 2005). The private sector provided similar information sources for many commercial services.

In order to foster sustainable development, it is recommended that the following further actions take place:

- Support extension of wireless broadband connectivity to all schools, especially in rural areas;
- Support curriculum development and extensive teacher training to make effective use of expanding on-line knowledge resources;
- Encourage, facilitate and support policy reforms enabling school-based community “hotspot” networks, and support pilot undertakings to demonstrate their utility in facilitating local economic and social development;
- Support pilot projects demonstrating new, low-cost computer, projector, and handheld display technology options for educational use and encourage local manufacturing or lowered import duties for such equipment;
- Support pilot projects demonstrating low-cost lighting technologies that can enable expanded home learning opportunities;
- Support development of easily accessible knowledge bases and e-services as, for instance, the initiatives supported by the Inter America Development Bank (the largest lending development Bank in the LAC Region) including, among others, the “Latin American Network of Education Portals (<http://www.relpe.org>), the “International Virtual Education Network” (<http://rived.proinfo.mec.gov.br/>), and the “Education Connectivity Pilot Project” (<http://www.iadb.org/en/projects/project,1303.html?id=tc0104012>)

Pillar 2: ICT and Health

Over the past years, distribution of healthcare services improved, in part by extension of wireless connections to hospitals, clinics, pharmacies, and even front-line health workers, through expanding mobile networks and newer broadband wireless networks and solutions. That allowed real-time monitoring of diseases, rapid response to disasters and health emergencies, more extensive support for front-line health workers, and timely restocking of medicines. Also, software tools initially pioneered in Peru (Casas and Lajoie 2006) became widely adopted by the countries of the Region. These national health networks (which increasingly integrated private clinics and hospitals and new franchised clinics and pharmacies) not only increased the operational efficiency of the health care system, but also enabled:

- Expanded telemedicine efforts through both, remote screening and diagnosis and live consultations with national or international experts on particular cases and, thereby, improving the standard of care in many smaller towns and remote villages;
- Inexpensive digital distribution of public health information, including easily-updated video and audio segments on inexpensive devices in every clinic and in many schools and communities centers, allowing for private viewing and listening for such sensitive issues as HIV/AIDS or drug addiction, reinforcing public TV and radio campaigns, and providing basic information on maternal health (Kimani 2008), infant nutrition, and other common health needs;
- Expanded training of health workers at all levels through on-line courses and testing (HfALA 2007).

A second wave of improvements followed the increasing sophistication of mobile phone and other “smart” mobile devices. These next-generation mobile devices had “smart card” capabilities built in, as well as the ability to automatically update stored information via short-range wireless techniques (Anta,

An Innovation-Based and Sustainable Knowledge Society

El-Wahab and Giuffrida 2009). As a result of the wide promotion of encryption standards and support for a cooperative effort between health ministries and mobile phone companies, people now carry their medical records and health insurance information in their phones, updated with every clinic or pharmacy visit. This support ensured that doctors, nurses and other health workers carried more sophisticated devices or phones that could access secure databases; frontline health workers even had handheld devices that contained diagnostic or procedural scripts and diagrams to guide their procedures. The combined result of these smart mobile devices and supporting databases included:

- Improved patient management and records while maintaining confidentiality;
- Simplified administration and billing that determines considerable cost savings and represents an opportunity to leapfrog ahead on a problem that confronts every healthcare system.
- Improved emergency treatment of patients, since even ambulances carried the equipment to “read out” a patient’s cell phone records;
- Increased efficiency for medical personal and enhanced capacity for frontline health workers, even when dealing with non-routine problems.

These changes improved health care at all levels, but amounted to a revolution in the access to and quality of care, especially for low-income populations. Improved health, in turn, eliminated one of the causes of persistent poverty.

In order to foster sustainable development, it is recommended that the following further actions take place:

- Support network extension to connect all healthcare facilities and mobile access for all health workers, including frontline (rural) workers, and support software development and applications to enable real-time reporting;
- Support pilot projects for public health information dissemination via clinics and community centers using new and inexpensive handheld display devices;
- Contribute to the establishment of public-private partnerships with telecom carriers, health ministries and other organizations towards the implementation of encryption standards and privacy policies, and to enable next-generation “smart” mobile devices to encode and manage personal health records;
- When possible, support pilot projects for electronic billing models and emergency system use of mobile personal health records.

Pillar 3: ICT and E-Government Services

Over the past years, extension of wireless connections to schools, healthcare facilities, and local government offices, especially in rural or underserved areas, provided the infrastructure foundation for e-government services. The policy reform that allowed “social purpose” community WiFi hotspots based in schools, clinics and community centers, and low-cost voice-over-internet phones (or mobile phones with WiFi capability built-in) connected via those hot spots, broadened access to the majority of the population (ITU 2011). However, the real transformation occurred as governments began to reshape their administrative processes and public services for the Knowledge Society.

The initial wave consisted mostly of voice-enabled databases, in all relevant local languages, accessed by toll-free calls from mobile or voice-over-internet phones. These information services initially provided public health information on HIV-AIDS or other health issues, information about agricultural extension services for an area, disaster reporting and relief information, guidance about availability of government programs, and a few simple voice-based transactions. But as the modernization of the state and government restructuring efforts based on global ICT best practices began to pay off, more sophisticated transactions (obtaining a passport, registering a land title) and one-stop integrated services spanning multiple agencies began to appear (Castillo López 2011). Use of low-cost software that allowed citizens to comment on or query government agencies, and for agencies to explain their policies, began to spread.

A powerful indirect benefit of expanding access to connectivity and to government services via Internet or phone links was increasing transparency (Casasbuenas 2011). Virtually all agencies now felt obliged to report budgets, expenditures, contracts and winning bidders, and related information on line. Businesses large and small, and citizens groups, tracked performance of government and were quick to question discrepancies. Some governments now required ministers and heads of agencies to disclose income and bank accounts. As a result, corruption declined significantly (Lidman 2011).

Moreover, with widespread connectivity, citizen participation and activism increased. Local discussions and organization via phone and text-messaging networks became more common. Governments found it increasingly important to explain their actions and seek consensus on potentially controversial policy issues, often via e-government networks. The result, even if sometimes chaotic, was more accountability and more active democracy throughout the developing countries.

In order to foster sustainable development, it is recommended that the following further actions take place:

- Support extension of wireless networks to rural areas, especially connectivity to schools, clinics, and local government offices;
- Encourage and support policy reform aimed at enabling local community wireless networks or hotspots under a “social use” exemption, where low-cost networks are not supported by legacy carriers;
- Support pilot projects for voice-accessible and Internet-based information bases, as a first wave of e-government services;
- Support re-engineering integration of government processes to enable sophisticated, one-stop e-government services;
- Support the use of interactive tools on e-government web sites and, thereby, encouraging transparency and government responsiveness.

Pillar 4: ICT and Financial Services

Compared to six year ago, the transformation of the economies from cash to cashless transactions is already well advanced. The primary stimulus for this change has been the increasing sophistication of mobile phones and other “smart” mobile devices with “smart card” capabilities built in. Equally, however, the business models incorporated lessons learned from earlier mobile financial services. As a result, smart mobile devices increasingly became portable banking terminals, electronic wallets, and the payment system of choice (stored account balances or credit status were updated with every transaction, usually by simply swiping the phone near the retail terminal). With encryption and often thumbprint

An Innovation-Based and Sustainable Knowledge Society

or pass-code protection, the devices were more secure than cash or old-fashioned credit cards. This revolution was largely driven by the private sector, but efforts catalyzed early adoption of standards and modernization of financial regulations to facilitate the transformation, as well as encouraging extension of wireless networks to rural areas.

Mobile electronic transactions, instant banking, and cashless commerce were a great convenience. However, for the majority of the population, especially those with low incomes, the impact was more profound (Tejerina and Westley 2007) and included such benefits as:

- Extension of modern financial services including credit to the majority of the population, with much greater ease of access (no need to get to a bank branch, available at all hours of the day);
- Cheaper and faster means of transferring remittances from abroad. This derived in an accelerated modernization and capitalization of the micro-credit financial system fed by growing financial remittances and the resulting mobilization of credit resources and modern financial services;
- Greater safety, because not carrying large amounts of cash meant less risk of robbery; thieves quickly learned that stolen phones not only would deny access, but also automatically alerted police to the theft and to their location;
- Transaction and credit records were created automatically, empowering many low-income participants in informal occupations with the evidence of credit-worthiness or purchasing power required to obtain loans or life insurance, buy on credit, or otherwise interact with the formal economy;
- Even small transactions, and small amounts of credit, could be done electronically, via text-messaging or short-range wireless transfer, facilitating even the informal economy but linking it more closely to the banking system;
- With automation came reductions of transaction costs, more affordable financial services, and expansion of both credit and pre-paid commercial transactions.

The result was the inclusion of most of the population in the formal financial systems and, thereby, increasing equality of access to services (Tejerina, Bouillon and Demaestri 2006). Microfinance became a fully commercial activity, effectively providing similar services traditionally provided by all major financial entities. Such transformation also reduced informality and markedly increased the efficiency of local economies, stimulating investment and accelerating growth. These initiatives aim at reducing the transactions costs of international remittances to the Region and tying such cash flows to the development of the micro-credit sector. The deployment of ICT solutions is instrumental in meeting the objectives of such initiatives.

Equally important, with electronic systems and record keeping incorporated in most small and medium enterprises, large financial institutions and special venture funds increasingly began to provide finance for previously neglected enterprises. As this “meso-finance” expanded, small and medium sized enterprises (SMEs) began to fulfill their potential as growth engines for economies.

In order to foster sustainable development, it is recommended that the following further actions take place:

- Support wireless network extensions to rural areas as appropriate;
- Promote and facilitate the establishment of public-private partnerships with telecom carriers, bank regulatory agencies and private sector, among others, to catalyze the adoption of common stan-

standards for mobile transactions and updated banking regulations to enable financial transactions and banking services via next-generation “smart” mobile devices, and Internet-based applications;

- Finance and implement demonstrative and pilot projects to promote best practices and accelerate adoption.

Contributing to the development of less developed economies requires an environment that facilitates the deployment of ICT, its dissemination and use in various institutional, business and social settings.

An effective environment conducive to the promotion and use of ICT to foster development requires a number of concrete actions at the strategic level under a multi-sector approach that is transversal to all the initiatives described above:

- Strengthening of the institutional capacity with the participation of the public, private and civil society sectors, in order to promote and foster the dissemination and use of ICT through programs and initiatives that build a participatory knowledge society;
- Raising awareness and creating the conditions for the design and implementation of pilot initiatives and the replication of best practices in the priority areas discussed in this paper;
- Creating the organizational conditions for the identification of concrete and comprehensive national ICT investment plans which effectively delineate the participation of the various sectors and stakeholders;
- Implementing and/or strengthening national and regional regulatory frameworks to promote competition and loosen restrictions on the telecommunications market, allow for the expansion of media convergence, and promote and facilitate research and technological innovation.

All the above requires not only a concrete delineation of the responsibilities that the public, private sector and civil society should assume, but also the promotion and establishment of partnerships based on their mandates, responsibilities, purpose and competitive advantages. Experience shows that these partnerships allow for addressing multiple issues that cannot be resolved without the concerted efforts of diverse constituents, while also allowing for synergies, coordination and sharing of priority investments, and ultimately leading to a more efficient and sustainable process of economic and social development and inclusion through the deployment of appropriate and innovative technologies.

With respect to the public sector, experience shows that ICT-based programs aimed at enhancing the reach and impact of social development and inclusion programs not only strengthen the capacity of the public administration, at the national, local and regional levels, to deliver public services, but also contribute to building public trust while enhancing citizen participation.

With respect to the private sector, active participation of the technology-based private sector represents a pivotal source of innovation for promoting social development, and creating local jobs, income opportunities and wealth. This can be achieved:

- Through the effective implementation of market, regulatory and institutional conditions to create the incentives necessary to balance social responsibility with profit motives (blended strategy);
- By promoting the participation of the private sector through ICT and connectivity investments and technical assistance in priority social sectors while, at the same time, creating value-added opportunities and the expansion of ICT-based social and financial services to underserved communities;

An Innovation-Based and Sustainable Knowledge Society

- Tapping the profit potential that can be realized from efforts aimed at improving the social and economic conditions of the socially excluded vulnerable groups, national governments should pursue actions that facilitate financial and technical assistance instruments to effectively adapt to the demand of its citizens, and support activities to provide and facilitate access to efficient ICT tools for the exchange of information, ideas and knowledge, and the deployment of ICT.

ICT offers many opportunities to also improve the ageing process in the pillars above (Lehmann, Giacini and Davis 2012). Along with a major role for ICT in the public health arena (e.g., mobile technology) comes the ability to offer health interventions, and education and preventive strategies that can address the global challenges of the digital divide. To date, efforts to include the aging population in the Knowledge Society have been limited. Research indicates that when ICT is used as an enabling tool, all generations benefit and quality of life improves.

Mobile ICT is also promoting economic growth by helping communities compete in local and global marketplaces (e-commerce). Improving socio-economic development, particularly in developing countries, is due, in large part, to improved access to timely information (easing the burden of information seeking which is extremely difficult in remote locations). With mobile technology, literally in-hand, farmers negotiate crop prices (e-agriculture); fishermen locate rich fishing spots (via satellite mapping), migrant workers use mobile banking (e-banking) and governments offer citizens the ability to register land, and educational, health, and voting opportunities (e-government). ICT can also increase jobs opportunities by reducing the need for unnecessary travel to better perform one's job, particularly in the case of disability (see, for instance, the case of the Sao Paulo "Center of Excellence for Technology and Innovation in Favor of Persons with Disabilities" in Brazil (CETID 2011))

Finally, with respect to the civil society, adequate organizational arrangements must be in place to facilitate the participation of civil society organizations in the promotion and implementation of community-based development programs and, thereby, complement public sector investments in connectivity, ICT solutions in health care facilities, schools, and neighborhoods, the development of local content and, overall, the delivery of social targeted actions at the local level.

3. A TRIPLE HELIX APPROACH

The International Council for Caring Communities (ICCC) is a not-for-profit organization that has Special Consultative Status with the Economic and Social Council of the United Nations. It was founded in 1994 to stimulate and showcase innovative concepts that deal creatively with the challenges of global longevity. ICCC acts as a bridge linking government, civil society organizations, the private sector, universities and the United Nations in their efforts at sparking new ways of viewing an integrated society for all ages.

In 2006 ICCC launched its "Windsor Format" that involves input from international decision-makers, world leaders and futurists, representing business, design, architecture, education, health, research and technology, along with local and central government and United Nations officials. The success of the "Windsor Format" is due to its non-traditional gathering of developing and developed country government officials, private sector decision-makers and related experts focused on 21st Century issues of global impact. From this point of view the "Windsor Format" can be considered as an example of a Triple Helix approach in action.

The Windsor Consultations Series takes place at St. George's House within Windsor Castle itself, so chosen to build upon its origins dating back to 1384 when it was established as a place where people of influence and responsibility could come together to explore and develop ideas, and possible solutions, to the problems of the day. The basic approach is to discuss, reexamine, rethink, redefine, and identify viable recommendations, up-scale successful projects and concrete plan of actions on existing and future programs.

These cross-sectoral Consultations have included: Age of Connectivity: Citizenship and Care for Cities of the Future; Knowledge Management: Modern Innovations & Technology towards the Knowledge Society; Government Training Revisited, and a three part series: Confronting the Diseases of Poverty; Technology and Innovation for Equity; Digital Health in the Age of AIDS; Climate Change, Health Systems & The Digital Revolution; Digital Health & The Orphans of Global Health: Child Mortality & Maternal Health, Chronic Non-Communicable Disease & Neglected Tropical Disease.

The ICCC's Triple Helix approach in action of the Windsor Consultations Series can be best appreciated by considering some particularly successful initiatives, namely: the "Citizenship and Care for Cities of the Future" Consultation, the "Knowledge Management: Modern Innovations & Technology towards the Knowledge Society; Government Training Revisited" Consultation and the "Age of Connectivity: Cities of Hope" initiative.

ICCC realized that "a sleeping giant" is awakening, "the agequake", as every month around the world over 1 million people turn 60 years old, with the fastest growth in developing countries. To address this challenging topic not yet on the "radar" of most governments, the first Windsor Consultation "Citizenship and Care for Cities of the Future" was held in October 2007 to stimulate awareness and action. The session addressed current and future trends with special attention to demographic shifts, rapid urbanization, migration, the increasing burden of chronic disease and changes in work and education. It explored new possibilities in information and communication technologies and the design of dwellings and cities, as well as, the increasing role of citizens providing the majority of care and support to family and friends who are ill, frail or disabled. Also, reviewed the potential impact of a number of worldwide trends on caring relationships and the provision of care present and future requirements.

The Consultation participants proposed launching an international initiative to support those involved in care as a contribution to the pursuit of the achievement of the Millennium Development Goals (MDGs) and the work of UN Habitat in cooperation with other related UN partners. Their recommendations focused on coordinating and leading public and private sector partners and contributors in activities that would:

- Demonstrate the possibilities open to policy makers and regulators in government, business and community and stimulate the design of products and services;
- Encourage and in practical terms release the potential of caregivers and strengthen their contribution and involvement in local economies and communities;
- Promote cross-disciplinary research and development programs by coordinating good practices and ideas from business, design, construction, employment, education, leisure and the arts to design and develop care-friendly living and working environments in developing and developed countries;
- Establish an international mentoring expert group and a virtual academy with global and local capacity to support urban and rural development initiatives that sustain caring relationships within and across ages and generations;

An Innovation-Based and Sustainable Knowledge Society

- Integrate the use of Mobile-health (M-health) and Mobile-learning (M-learning) technologies presently being used and developed for both developing (Africa) and developed countries;
- Encourage application of the Community Carte System (CCS), a Triple Helix approach, using a web-based system to collect, analyze and disseminate information on people's wellbeing, which can be easily incorporated in the websites of local authorities. People can use the web-based self-diagnostic tool to better understand their strength and vulnerabilities in the pursuit of wellbeing.

The Windsor Consultation's unique contribution to the "health and environment" dialogue drew on research experience in Europe and Africa, as well as the outstanding related work of UN Habitat and the newly launched WHO Age-Friendly Cities Project. It benefited from the insights and practical knowledge of experts¹ who reached the brief broadly stated conclusions and insights which included:

1. The economic and social contribution made by family and friend caregivers is highly significant and often equates or exceeds the contribution of services provided by government, non-governmental organizations and the private sector. Caregivers underwrite state provision and are an important but often unrecognized feature of national life.
2. Increasing longevity, population ageing and the rapid growth of non-communicable diseases mean that increasing numbers of people worldwide will become caregivers and will juggle work, education, care and other family responsibilities. People may become caregivers at any stage of life.
3. The provision of care and the ability to support a close relative or friend can add to and bring meaning to life. But, when the demands go beyond a certain level, caring can draw people out of work and community life altogether. The loss to individuals, local economies and communities is almost incalculable.
4. Worldwide trends such as urbanization and migration will exert an influence on patterns of care alongside increasing longevity and changing patterns of health and illness. Rapid urbanization can disrupt caring relationships just as it can create poverty, damage health and lead to economic and social hardship.
5. A focus on caring must be addressed and can offer a new dimension to urban planning. It offers the potential to contribute to the building of common agendas between different age groups and between the old and new communities who share urban space.
6. Over 10% of the population is likely to be involved in caring at any one time. It makes social and economic sense to work with citizens to strengthen caring, make it more possible for caregivers to remain in employment, take part in education and participate in urban governance which is enabled with the use of ICT. Policymakers' indifference will squander a precious resource for cohesion, integration and the improvement of lives in slums and throughout society generally.
7. For all these reasons, one of the key Windsor recommendations is that support for caregivers should be just as much a part of the everyday infrastructure of cities and settlements as roads, hospitals and schools.

In the Windsor tradition the "Knowledge Management: Modern Innovations & Technology towards the Knowledge Society; Government Training Revisited" Consultation, that was held in 2007, broke new ground by gathering for the first time a "non-traditional" group of dignitaries, senior decision-makers, donors, and leading experts including government officials from selected developing and developed

countries directly involved in designing and implementing Knowledge Management programs.² This convergence and crossing-over of public research, business and governments which were previously separated represented a good example of the Triple Helix model in action.

The Consultation stimulated practical recommendations, reviewed up-scale successful projects and developed a concrete plan of actions related to how existing and future training packages under the United Nations Public Administration Network (UNPAN) platform can be managed and developed effectively in an effort to ensure that the basic objectives of government and civil society organizations are enhanced. It established the essential building blocks for productive sharing of experiences and future actions; recommendations evolved from a Triple Helix approach:

- Presentation of the UNPAN training program on areas of assistance and cooperation, namely, improving the content of the exiting modules, increasing accessibility to the UNPAN training modules for potential participants from the developing countries by providing an opportunity to free internet access, and translation of training modules;
- Presentation of the existing training programs in the area of e-governance and knowledge management;
- Presentation of developing country projects in the area of new technologies including the mobile technology (M-Technologies) such as M-Education and M-Health;
- Exploring partnership opportunities and needed actions to support the UNPAN training program as well training programs of the participating institutions through strengthening cooperation and collaboration among the participants of the Consultation.

Results encouraged “Partnership in Practice,” another typical aspect of the Triple Helix approach, using ICT to spearhead rethinking of priority actions and strengthen the effectiveness of existing institutional frameworks and implementation mechanisms between developed and developing countries as well as between developing countries using South-South cooperation as an effective modality for social and economic development, as well as, enhancing regional and interregional Knowledge Management (KM) cooperation and integration for accelerated socio-economic development in the globalized environment.

The ICCC initiative “Age of Connectivity: Cities of Hope”, another example of a Triple Helix in action approach, seeks to create an open network, which leads to international planning and advisory groups seeking to involve public and private sector organizations in a range of activities supporting the overall goals.

In its first stages the initiative will bring the proceedings of Windsor and New York and later developments to a worldwide audience as the first step in the formation of an international mentoring group and academy and seek partnerships, alliances, regional hubs and interest groups to create and disseminate ideas and bring the products to local and national attention by taking the following steps:

- Draw up a business plan
- Set targets
- Secure the agreements necessary to acquire the resources
- Build an organization capable of contributing to the achievement of the Millennium Development Goals in the period to 2015.

This proposal is based on the recommendations of the Windsor Consultation ‘Citizenship and Care in Cities and Settlements of the Future’ and formulated by Consultation members following a High Level Working Session held at UN Headquarters in New York on February 8, 2008.

4. CONCLUSION

ICT is changing the way people live and do business globally, and is creating new social and economic development opportunities especially for lower-income populations, by enlarging markets and facilitating greater access to information, public services and economic activity. The effective deployment of ICT can create or expand economic and social opportunities for a growing share of the population in the developing countries and bring unprecedented opportunities to tackle the challenges faced by lower-income populations in their efforts to participate in and benefit from the growth of the knowledge economy. Yet, these opportunities to be effectively and fully realized require the active participation of the public, private and civil society sectors under integrated efforts towards the development of an inclusive knowledge society. This makes the Triple Helix model an interesting new paradigm of development and inclusion that, when applied along with a good ICT infrastructure, could help achieving a more fair distribution of digital dividends to developing countries, reducing the digital divide and helping attaining the Sustainable Development Goals (SDGs).

In this paper we described a number of sustainable development scenarios for the developing countries based on these principles. In discussing those scenarios, we aimed to contribute to the articulation of a best-practices manifesto that regional, national and local governments may want to pursue in fostering a socially inclusive knowledge society in which the “digital dividends” can flow to the majority at the base of the population’s pyramid, empowered through the deployment of ICT.

In particular, we described some of the International Council for Caring Communities’ best “Triple Helix approach” practices that have stimulated new avenues for discussion/dialogues and policy development that bring to the fore the role that innovation can play in the economic growth and well-being in developing countries. ICCC acts as a bridge linking government, civil society organizations, the private sector, universities and the United Nations in their efforts to devise new ways of building an integrated society. From this point of view, the ICCC’s approach can be considered as a “Triple Helix in action” approach.

The ICCC gatherings composed of a non-traditional group of decision makers and experts from government, international organizations, local authorities, the private sector, academia, health organizations and related industries, have been ICCC’s centerpiece for addressing social and economic issues. This format, in our opinion, represents a good model for tackling development issues and deploying new development strategies. Altogether, the ICCC model, considered as a “Triple Helix in action” approach, represents the “breaking” of the old approach to international development, and the onset of a new effective one.

The results of the gatherings in fact, have been a series of practical recommendations and promotion of a “Call for Action!” agenda. The method stimulated “fast-track” awareness of information “gaps”, directly and indirectly promoted collaboration, and enhanced cost-effective use of limited funds to be used for international development. It also added an important element that focused and fostered the “connecting the dots” mindset to enhance community, health, well being and the quality of life and that supported the attainment of the MDGs and the post-2015 sustainable development agenda.

REFERENCES

- Anta, R., El-Wahab, S., & Giuffrida, A. (2009). *Mobile Health: The potential of mobile telephony to bring health care to the majority*. IDB Publications 8600. Inter-American Development Bank.
- Assolombarda. (1994). *Ricerca ed innovazione tecnologica: Analisi del fabbisogno delle aziende*. Milano.
- Barbosa, F. A. (Ed.). (2011). *ICT EDUCATION 2010 - Survey on the use of Information and Communication Technologies in Brazilian Schools*. Sao Paulo: Brazilian Network Information Center.
- Bellavista, J. (1997). The Barcelona Science Park: a triple helix model in the Catalan and Spanish Research System. In H. Leydesdorff & H. Etzkowitz (Eds.), *A Triple Helix of University-Industry-Government relations. The future location of research*. Academic Press.
- Belsey, A. M. (2005). *AIDS and the Family: Policy Options for a Crisis in Family Capital*. UN Department of Economic and Social Affairs.
- Bhaskaran, R. (2004). *Digital Gangetic Plains (DGP): 802.11-based Low-Cost Networking for Rural Areas - 2001-2004: A Report*. The DGP Media Labs Asia Team. Available: <http://www.cse.iitk.ac.in/users/braman/papers/dgp-report.pdf>
- Bhusal, P., Zahnd, A., Eloholma, M., & Halonen, L. (2007). Energy-efficient innovative lighting and energy supply solutions in developing countries. *International Review of Electrical Engineering*, 2(5), 665-670.
- Brewer, E., Demmer, M., Du, B., Fall, K., Ho, M., Kam, M., & Surana, S. et al. (2005). The Case for Technology for Developing Regions. *IEEE Computer*, 38(6), 25–38. doi:10.1109/MC.2005.204
- Buckner, L., & Yeandle, S. (2011). *Valuing Carers*. Carers; doi:10.4018/IJKSR.2015070103
- Bush-Brown, A., & Davis, D. (1992). *Hospitable Design for Healthcare and Senior Communities*. Van Nostrand Reinhold.
- Campodall'Orto, S., & Ghiglione, B. (1997). The Technology Transfer Process within the New Innovation Models, in *Managing Technological Knowledge Transfer*. EC-Social Sciences COST, A3 (Vol. 4). EC Directorate General, Science, research and Development, Brussels.
- Casas, C., & Lajoie, W. C. (2006). *The Fortune at the Bottom of the Pyramid. The Voxiva Story*. Wharton School Publishing.
- Casasbuenas, G. J. (2011). The contribution of Colombian Civil Society Organizations to e-government for the Improvement of Transparency through the Use of Information and Communication Technologies. In D. Piaggese, K. J. Sund, & W. Castelnovo (Eds.), *Global Strategy and Practice of E-Governance: Examples from Around the World* (pp. 324–337). New York: IGI Global. doi:10.4018/978-1-60960-489-9.ch018
- Castillo, R. L. (2011). Municipal Mobile SMS Services: An e-Government Initiative of the Municipality of La Paz, Bolivia. In D. Piaggese, K. J. Sund, & W. Castelnovo (Eds.), *Global Strategy and Practice of E-Governance: Examples from Around the World* (pp. 24–33). New York: IGI Global.

An Innovation-Based and Sustainable Knowledge Society

CESPRI. (1997). *Cambiamenti nella struttura industriale lombarda e politiche regionali per l'innovazione tecnologica, Rapporto di ricerca*. Milan: University Bocconi.

CETID. (2011). *The Center of Excellence for Technology and Innovation in Favor of Persons with Disabilities (CETID)*. Available: <http://www.sedpcd.sp.gov.br>

DOT-Force. (2001). *Digital Opportunities for All, Report of the G8 Digital Opportunities Task Force*. DOT-Force.

Dzidonu, C. (2010). *An analysis of the role of ICTs to achieving the MDGs*. UNDESA. Available: unpan1.un.org

Ericsson and Digital Health Initiative. (2011). *Challenges and Opportunities in Scaling UP Digital Health*. Author.

Etzkowitz, H. (1994). Academic-Industry Relations: A Sociological Paradigm for Economic Development. In H. Leydesdorff & P. Van den Besselaar (Eds.), *Evolutionary Economics and Chaos Theory: New directions in technology studies*. London: Pinter.

Etzkowitz, H. (1997). The Triple Helix: Academy-industry-government relations and the growth of neo-corporatist industrial policy in the U.S. In S. Campodall'Orto (Ed.), *Managing Technological Knowledge Transfer*. EC Social Sciences COST A3 (Vol. 4). EC Directorate General, Science, Research and Development.

Eurofound. (2004). *Health and care in an enlarged Europe*. European Foundation for the Improvement of Living and Working Conditions.

Eurofound. (2006). *Employment in social care in Europe*. European Foundation for the Improvement of Living and Working Conditions.

Fondazione Rosselli-CES&T. (1995). *Analysis of the regional science & technology policies in Europe* (CE-DG XII, Grant Contract: PSS*0819). Fondazione Rosselli.

Gebhardt, C., & Etzkowitz, H. (1996). Regional innovation Organiser: a quasi-public role for transnational corporations and universities. *Management and New Technology*, COST A3.

Heimerl, K., & Brewer, E. (2010). The Village Base Station. *Proceedings of the 4th ACM Workshop on Networked Systems for Developing Regions*. doi:10.1145/1836001.1836015

HfALA. (2007). *The Health for All in Latin America Project. Reference manual, theoretical and methodological framework, experiences and directory of best practices*. Perugia, Italy: Fondazione Angelo Celli.

HM Government UK. (2004). *Carers (Equal Opportunities) Act 2004*. London: The Stationary Office.

Ho, M. R., Smyth, T. N., Kam, M., & Dearden, A. (2009). Human-Computer Interaction for Development: The Past, Present, and Future. *Information Technologies and International Development*, 5(3), 1–18.

Hosman, L. (2010). A National ICT-in-Education Initiative: Macedonia Connects. In *E-Strategies for Technological Diffusion and Adoption: National ICT Approaches for Socioeconomic Development* (pp. 1–18). New York: IGI Global. doi:10.4018/978-1-60566-388-3.ch001

- ICCC. (2002, April). Ageing Dialogues 2020: the Future of Ageing. *Proceedings of the Second World Assembly on Ageing*, 131-132.
- ICCC. (n.d.). *International Student Design Competitions Retrospective – 1994-2005*. Retrieved from <http://www.unpan.org/Regions/Global/Directories/Resources/tabid/456/ItemID/1836/language/en-US/Default.aspx>
- ICCC. (n.d.). *Music As A Natural Resource: Solutions for Social and Economic Issues – Compendium*. Retrieved from <http://www.unpan.org/Regions/Global/Directories/Resources/tabid/456/ItemID/1836/language/en-US/Default.aspx>
- International Longevity Center-USA and Schmieding Center for Senior Health and Education. (2006). *Caregiving in America*. International Longevity Center.
- ITU. (2011). *Measuring the Information Society 2011*. Geneva, Switzerland: International Telecommunication Union.
- ITU and UNESCO. (2010). *A 2010 Leadership Imperative: The future built on BROADBAND*. A Report of the Broadband Commission.
- Jones-Evans, D. (1997). Entrepreneurial Universities - Cases of Good Practices from the Republic of Ireland. *Proceedings of the International Conference: Technology Policy and Less Developed Research and Development Systems in Europe*.
- Kimani, M. (2008). Better health at the click of a button: Information helps Rwandan clinics reach out. *Africa Renewal*, 22(1), 5. doi:10.18356/48f5cee5-en
- Kusakabe, M. (2012). *Measuring Wellbeing for the City of Liverpool*. Open City Foundation Wellbeing Survey Series.
- Lane, D., Malerba, F., Maxfield, R., & Orsenigo, L. (1991). Choice and Action. *Journal of Evolutionary Economics*.
- Lehmann, C. A., Giacini, J. M., & Davis, D. (2012). *Innovative and Technology for the Ageing*. U.N. Publications.
- Leydesdorff, H., & Etzkowitz, H. (1996). Emergence of a Triple Helix of University-Industry-Government Relations. *Science & Public Policy*.
- Leydesdorff, H., & Etzkowitz, H. (Eds.). (1997). *A triple Helix of University-Industry-Government relations. The future location of Research, Book of Abstracts*. Science Policy Institute, State University of New York.
- Leydesdorff, H., & Van den Besselaar, P. (Eds.). (1994). *Evolutionary Economics and Chaos Theory: New directions in technology studies*. London: Pinter.

An Innovation-Based and Sustainable Knowledge Society

- Lidman, R. (2011). Is the Internet Mightier than the Sword: An Anti-Corruption Perspective. In D. Piaggese, K. J. Sund, & W. Castelnovo (Eds.), *Global Strategy and Practice of E-Governance: Examples from Around the World* (pp. 340–358). New York: IGI Global. doi:10.4018/978-1-60960-489-9.ch019
- Mace, J. C. (2007). *Powering up: Information Technology for Rural Schools in Latin America and the Caribbean*. Enersol Associates. Available: http://www.enersol.org/programs/docs/EduSol-Paper_Dec2007.pdf
- Patra, R., Pal, J., Nedeveschi, S., Plauche, M., & Pawar, U. (2007). Usage Models of Classroom Computing in Developing Regions. *Proceedings of International Conference on Information Technologies and Development (ICTD2007)*, 158-167. doi:10.1109/ICTD.2007.4937401
- Piaggese, D., & Davis, D. (2015). The Triple Helix Approach for the Creation of a Knowledge Society. *International Journal of Knowledge Society Research*, 6(3).
- Prahalad, C. K. (2005). *The fortune at the bottom of the pyramid*. Wharton School Publishing.
- Tejerina, L., Bouillon, C., & Demaestri, E. (Eds.). (2006). *Financial Services and Poverty Reduction in Latin America and the Caribbean*. Washington, DC: Inter-American Development Bank.
- Tejerina, L., & Westley, D. G. D. (2007). Financial services for the poor: household survey sources and gaps in borrowing and saving. Sustainable Development Department - Technical Papers Series, Inter-American Development Bank.
- Teknova. (1995). *Sistema di monitoraggio della ricerca scientifica e dell'innovazione tecnologica in Lombardia*. Ricerca IRER cod. 93.64.
- The Royal Society. (2006). *Digital Healthcare: The Impact of Information and Communication Technologies on Health and Healthcare*. The Royal Society.
- UNDESA. (2007, October). *Intergenerational Solidarity: Strengthening Economic and Social Ties*. Expert Group Meeting and Background Paper, UN Department of Economic and Social Affairs, Division of Social Policy and Development.
- UNESCO. (2005). *E-government toolkit for developing countries*. UNESCO. Available: <http://unesdoc.unesco.org/images/0013/001394/139418e.pdf>
- Venne, R. (2005). *Mainstreaming the concerns of older people into the social development agenda*. United Nations Secretariat: Division for Social Policy and Development.
- Viale, R. (1998, March 4). *Tripla elica in Lombardia: evoluzione nel raccordo tra ricerca, impresa e governo*. Conferenza Regionale della Lombardia - Scenari dello Sviluppo, Milano, Italy.
- Viale, R., & Ghiglione, B. (2005). *The Triple Helix model: a Tool for the Study of European Regional Socio Economic Systems*. Fondazione Rosselli Publication.
- Vota, W. (2010). Updated Quick Guide to Low-Cost ICT Devices for Educational Systems in the Developing World. infoDev, the World Bank.

Wilson, M., & Warnock, K. (2007). *At the heart of change: the role of communication in sustainable development & the case for communication in sustainable development*. Panos Publications.

World Bank. (2004). Building blocks of e-government: lessons from developing countries. PREMnote, number 91, the World Bank.

Yeandle, S., Buckner, L. (2007). *Carers, Employment and Services: Time for a new social contract?* Carers, Employment and Services Report Series, 6.

ENDNOTES

¹ Awarded 501.c.3 status by US-IRS in March 2013.

² See our Website www.FRAmericas.org.

APPENDIX: ON-GOING RESEARCH AT FRAMERICAS

FRAmericas is a US-incorporated non-for-profit, charitable¹ organization, devoted to applying latest knowledge and technology achievements to improve living conditions and enhance income generation among low-income groups. FRAmericas was originally established in 2010, to cover the American continent as a branch of Fondazione Rosselli (FR), a prestigious Italian Foundation devoted to research and study of public policy as it relates to major societal and economic issues, seeking answers to the complex questions faced today by governments and citizens alike through the application of behavioral and cognitive science. FR works in coordination with the Organization for Economic Cooperation and Development (OECD) and it is host to its library in the subjects of expertise of the FR. FRAmericas has evolved naturally from this beginning, to acquire an individual identity and a more focused mission that emphasizes application of research for social purposes with a global reach. In 2015 FRAmericas has been awarded the United Nations consultative status.

Scope and Programs of FRAmericas

Outlook

FRAmericas is built on the concept that all social phenomena are inter-connected and global in nature, and on the belief that investing in human knowledge would maximize the benefit of this inter-connection. Economic stability in the poorest parts of the world reduces pressure on the richest regions; control of environmental degradation in developing countries amount to sustained ecosystem services locally, but also to reduced risks of climate change impacts for the rest of the world; knowledge generated in one region of the planet can be hugely useful and consequential in another.

FRAmericas also believes that new technologies bid great promise to allow countries to leapfrog to better, more inclusive and democratic futures, as technology innovation can multiply the reach and benefits of development investment, and touch wider audiences that could not have been easily reached by more conventional means. The accelerated pace at which technology innovation grows must be harnessed to put it to use to improve the conditions of all humanity, not only of the privileged few. Societies based on technology innovation and knowledge products are societies with the potential to become more egalitarian, more equitable and more prosperous in a sustainable way.

While large international organizations such as the United Nations and Multi-Lateral Development Banks work to create this balance at a macro scale, there is ample room and need for interventions at the local level, where citizens on both sides of the spectrum can act directly to positively affect one another. This is the realm of non-for-profits such as FRAmericas: the creation of bridges between citizens and private organizations worldwide, who believe in the value of individual actions to achieve global impacts. FRAmericas aims to give individuals a choice in the way their tax dollars are used: through the central government accounts, or in clearly identified, transparently managed, and directly beneficial projects and actions that benefit many while at the same time generate global public goods such as social stability and a sustainable environment.

FRAmericas' global vocation is reflected in its own history: born in Italy and acting in Europe; incorporated in the USA and working for developing countries in the three continents it also fosters south-south cooperation among them. FRAmericas uses all possible connections and networks to maximize the

impact of its activities. Through FRAmericas, citizens of all countries gain a window to other realities and other perspectives. Through FRAmericas, individuals and private organizations are empowered to take action locally and achieve results globally².

Objectives

FRAmericas' objective is to promote socio-economic development by contributing to the creation of knowledge societies, capable of enhancing income opportunities and quality of life for low-income groups.

To achieve this objective, FRAmericas has concentrated its efforts initially in two areas: promoting *innovation* in the scope and means of development assistance, and advising on *public policies* needed to support such innovation. To support innovation FRAmericas promotes technological and organizational innovation projects applied to the search for solutions and alternatives for humanity to cope with today's most pressing global issues, such as social inclusion, climate change, alternative energy sources, and urban growth, among others. To foster corresponding changes in public policy FRAmericas promotes the discussion and analysis of areas which are perceived to hold the greatest potential for changing significantly the future of humanity, such as converging technologies, Web Democracy, the use of information and communication technologies (ICT) applied to development purposes, the growth of Knowledge Economies and the creation of Knowledge Societies.

Priority Areas of Interest and Work

FRAmericas works through three main programs:

1. Design and implementation of development projects through its International Knowledge Economy Program (IKEP).

IKEP provides technical assistance to Governments and direct financial assistance to practitioners for the development and application of technology innovation to development strategies, tools and products. IKEP utilizes the latest information and communication technologies to foster the creation and expansion of the Knowledge Society in developing countries.

At the country or "macro" level, IKEP fosters planning tools that exploit a country's comparative advantage through investment in sectors whose growth is based on the capture and dissemination of knowledge, as a tradable good. Typically, these projects will seek to identify where the knowledge capital of a given country lays, whether it is in the wealth of traditional knowledge accumulated by local communities; or new knowledge derived from original research; or knowledge adapted from other sources to conform to the needs of a certain client group. At the organization or "micro" level, IKEP fosters growth strategies aimed at increasing effectiveness, efficiency or coverage, by fostering improved management of existing or newly acquired knowledge available to the organization.

To promote the expansion of Knowledge Societies whether at the macro or micro levels, IKEP fosters the application of an architecture which includes the simultaneous and coordinated implementation of action in five areas: research in technology innovation; investment in education; social inclusion; expansion of ICT infrastructure; and the establishment of enabling government policies, including intellectual property rights. It is the simultaneity of the intervention in several fields that distinguishes IKEP's ap-

proach to development from other --more conventional-- methods, which are typically sector-specific; IKEP's approach bears greater promise to achieve durable solutions to the complex problems faced by low-income communities and developing countries in general.

FRAmericas develops strategic project ideas in favor of developing countries with active participation of potential beneficiaries. IKEP projects also promote south-south cooperation to multiply the impact of project financing.

2. Life-long education through the ICT4DEVIS program.

FRAmericas' Information and Communication Technology for Development International School (ICT4DEVIS) provides life-long learning opportunities for those interested in bridging internet-related applications to development needs. ICT4DEVIS offers formal education and training opportunities for students and practitioners of any age interested in furthering their education in the fields of technology and innovation for international development.

FRAmericas uses this program to prepare the future "change agents" in the field of ICT and all technology innovation applications for development. Sessions are organized and hosted by prestigious Universities worldwide offering conceptual and practical contents to bridge technology to development. Sessions involve in-person participation as well as simultaneous distance learning facilities. Students and interested parties --individually or in groups-- of all ages and from different backgrounds are encouraged to participate. Previous sessions have been organized and hosted by the University of Insubria, Como, Italy; and by the Interactive Robots and Media Lab & the Software & Knowledge Engineering Lab at NCSR "Demokritos", in Athens, Greece, in collaboration with the ARCOMEM and SOCIALSENSOR FP7 ICT research projects of the European Union.

3. Networking, advocacy, and open fora through the AKNOS program.

Using the platform "Academy for Knowledge Society" (AKNOS) FRAmericas disseminates best practices in worldwide efforts to foster knowledge-based economic growth and local action of global significance, through networks, fora, advocacy and publications. FRAmericas acts as a hub for current, former and future development practitioners interested in pursuing the promise of new technologies to achieve development objectives at an accelerated rate and with a wider reach. FRAmericas aims to build a strong network of experts, decision-makers, researchers, opinion leaders and regular citizens and it provides a forum where each can have a voice and express an opinion on the topics on the table. To do this, FRAmericas makes use of state-of-the-art Web-based information and the latest telecommunications technology to host Webinars where this discussion can take place. Observations derived from these virtual and in-person meetings are immediately available to the public. Special briefings and short summary documents are prepared for target audiences.