

ICTs FOR DEVELOPMENT: MOVING OUT OF THE PAKISTANI PARADOX

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ABSTRACT

Having an enthusiastic support from the government—at least for more than three years now—which declared IT as one of its four focus areas and has made substantial investment to put in place the infrastructure of Information and Communication Technologies (ICTs), with the result that Pakistan has the most extensive Internet-coverage in South Asia, and arguably has the cheapest rates for the provision of Internet. However, this has failed to initiate an effective process, which could make a significant impact on the lives of overwhelming majority of its citizens, especially those living in the rural areas of Pakistan. In terms of grass-root projects of ICTs, Pakistan has yet to present a good example, and in this respect lags behind other regional countries like Bangladesh, Sri Lanka and Nepal, not to say India, which can boast of hundreds of such initiatives. We look at some of the root-causes of this situation and come up with practical suggestions for leveraging the power of ICTs for development and alleviating poverty in the country.

1- THE TWO 'WAVES'

Two easily discernable 'waves' have been sweeping across the current of human history, during recent times. They have set in motion a train of changes that have already transformed the human-society, in ways that are nothing short of revolutionary. They are: (i) transition towards information-society, and (ii) revolution in ICTs.

1.1 Transition Towards Information-Society

According to observers of human-society, after passing through the ages of agriculture and industry, it is undergoing yet another change. The industrial revolution of the eighteenth century, in Europe, set in motion processes and mechanisms that changed it from a mainly agrarian mode of organization, to that dictated by the needs of large-scale manufacturing. Recently, however, this industrial age is giving way to what could be termed as the 'age of information'.

Information is fast becoming the key resource in the increasingly globalized world, we are living in, it is required at every level for making sound decisions. While *right information at the right time* has always been of strategic importance; more recently, in the late 20th century, information has acquired two basic utilitarian connotations. On one hand, it is considered to be an *economic resource*, almost at par with other tangible resources like labour, capital, and material. This view stems from evidence that the possession, manipulation, and use of information can increase the cost-effectiveness of both physical and cognitive processes. The second perception of information is that it is an *economic commodity* which helps to stimulate the worldwide growth of a new segment of national economies – '*the information service-sector*'. The rise in information- processing activities in manufacturing, as well as, in all other transactions and problem-solving activities by humankind has been phenomenal, giving rise to the so-called *information-society* and its concomitant *information-economy*. (see figure- 1).

Developing countries must also adjust to, or suffer exclusion from, the global economy and severe disadvantage in the competitiveness of their goods and services. According to Mahathir Mohammed, the Prime Minister of Malaysia, "*It can be no accident that today there is no wealthy developed country that is information-poor, and no information-rich country that is poor and undeveloped*"². Countries that fail to establish an effective information- infrastructure with a broad range of applications are doomed in the new emerging information-economy.

In this paper, we have tried not to make a distinction between *information* and *knowledge*, and the two have been used interchangeably. There is a growing consensus not only among academics, but also among the more practically oriented management-experts, that knowledge is fast becoming the most important strategic factor for competitive advantage. In a pronouncement that has almost become emblematic for our times, Peter Drucker, alongwith that dozen of management-gurus, say, "*Knowledge has become the key economic resource and the dominant*

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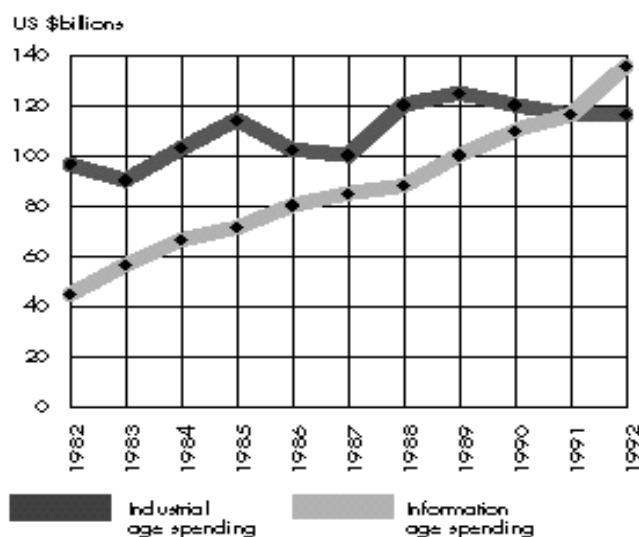


Figure-1: Rise of the Information-Economy. Capital spending (in 1987 dollars) by US companies for the industrial age (equipment, machinery for services, mining, oil fields, agriculture, construction) versus capital spending for the information age (computers and communications equipment). In 1991, for the first time, information age spending overtakes industrial age spending.¹

– perhaps the only – source of competitive advantage”.³

1.2 Revolution in ICTs

During the last two decades, we have seen a veritable revolution in Information and Communications Technologies (ICTs) that has the potential to profoundly affect all facets of our life. It has already transformed the way we communicate and do business in the *more developed world*.

Because of the empowering nature of these technologies, the world is now faced with a stark *digital divide*⁴, in addition to the already yawning income-divide between the *haves, and have-nots*. However, this revolution, like all-revolutions in the past, has also rekindled hopes, especially among growing group of development-practitioners. They aver that the technology-divide doesn't have to follow the income-divide and that the ICTs can become a powerful tool for human development and poverty-reduction⁵. They are fast becoming a cross-cutting theme for development-projects and programmes of diverse nature and scope.

In the case of Pakistan too, there has been a growing realization among the policy-makers about the great potential of these technologies, to the extent that the military government, at the time of its inception, declared Information-Technology to be one of its main focus-areas. The current civilian government is following suite in terms of encouraging the use of ICTs at all levels, with significant planned investment, in both infrastructure and application of these technologies.

2- ICTs AND 'CONVERGENCE'

While Information-Technology (IT) is a marriage of computers and telecommunications, with Internet as its prime global application, ICTs cover a whole array of technologies from computer in its various forms – large mainframes to tiny PDAs (Personal Digital Assistants) - and its peripheral devices (for example, printer, CD ROM, smart-card, etc.) to more conventional electronic communication media, like radio and television. Telecommunication-devices, from ordinary telephone to the increasing versatile mobile cellular-phone, also fall under this category. What ties together these distinct and apparently disparate tools and technologies is the *digitalization* of

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information that has given rise to what is called *convergence*.

According to this unifying principle, once information is converted into the digital form, it could be recorded, manipulated and communicated, using the same techniques and devices. To elaborate it further: there is no difference in processing a text-message, a voice-recording, a graphic image or a video-clipping, once they are digitized. Whatever apparent differences in form they represent, each of them ultimately consists of a series of *zeroes* and *ones* that characterizes digital information. This unity of diverse forms of information, coupled with the ease with which it could be processed through computing devices and communicated across the globe (especially with the help of Internet) has far reaching implications for managing information and knowledge.

3- UNIQUE CHARACTERISTICS OF ICTs

The principle of convergence and its application to the global Internet, especially the World Wide Web (WWW), gives rise to many unique characteristics of ICTs that dramatically improve communication and exchange of information. The most important of these, to make ICTs a strong enabler of development goals, are⁶:

- ICTs are *pervasive* and *cross-cutting*. They could be applied to a whole range of human activity, from personal use to business, education and government.
- ICTs are a *key enabler in creation of networks* and thus, allow those with access, to benefit from *exponentially increasing returns* as usage increases.
- ICTs foster the *dissemination of information and knowledge*, by separating content from its physical location. This flow of information becomes independent of where it is actually stored, transcends geographical boundaries and in theory could be accessed by anyone.
- The digital and “virtual” nature of many ICT products and services allows for *almost zero or negligible marginal costs*. Replication of content is virtually free, regardless of its volume, and marginal costs for distribution and communication are nearly zero.

- The power of ICTs to seamlessly store, retrieve, sort, filter, distribute and share information can lead to substantial *efficiency-gains* in production, distribution and marketing. They are thus, both the catalysts – towards an information-society as well as, facilitative tools, for it to function effectively.
- The increasing efficiency and reduction in cost engendered by the ICTs is leading to *wholly new products, services and distribution-channels*. They also foster models of *innovative business*, putting the greatest premium on knowledge and ingenuity of humankind.
- ICTs facilitate *disintermediation*, as it allows users to directly acquire products and services from the original provider, cutting out the notoriously profiteering middlemen.

Some of these features can be illustrated by WWW, launched initially as an application of Internet, but which has become synonymous with the Internet itself. During the last few years, it has been transformed into a virtual repository of the whole of human knowledge, information and enterprise. Organized like a vast multi-media global library, it is available to anyone who has access to Internet. The great advantage of putting information on WWW is that one can arrange it in intuitive, user-friendly formats; and with the help of powerful search engines, one can get to the desired information in a matter of seconds. Another benefit that accrues from putting information on WWW is that it becomes an essentially inexhaustible resource. One can make any number of copies of the documents that are placed on the Web. While it is generally true for any information in the electronic form, which resides on the Web, truly presents this possibility with global accessibility and easy-to-search mechanisms.

4- REAL ACCESS

When we talk of providing *real* access to the ICTs for optimal benefit to people and communities, it goes beyond computers and connections. The goal of such meaningful access to ICTs is to provide *right information to the right people at the time they need it, in forms they can understand*. And this shouldn't be just a one-way communication with people being passive recipients, but they should also be enabled to *express* themselves in forms they are comfortable

with. This requires a combination of *connectivity*, *content* and *capacity*, taking into account all the enabling socio-cultural factors.

Bridges.org is an international *not-for-profit* organization, with a mission to help people in developing-countries use ICTs to improve their lives. It promotes *real access* to ICTs by researching, testing, and promoting best practices for sustainable, empowering use of technology. It has come up with a set of dozen factors and determinants of what it terms as *real access*⁷. They are:

- i. *Physical Access*: Is technology available and physically accessible?
- ii. *Appropriate Technology*: What is the appropriate technology according to local conditions, and how people need and want to make use of technology?
- iii. *Affordability*: Is access to technology affordable for people to use?
- iv. *Capacity*: Do people understand how to use technology and its potential uses?
- v. *Relevant Content*: Is the content locally relevant, especially in terms of language?
- vi. *Integration*: Does the technology further burden people's lives or does it integrate into daily routines?
- vii. *Socio-Cultural Factors*: Are people limited in their use of technology, based on gender, race, or other socio-cultural factors?
- viii. *Trust*: Do people have confidence in, and understand the implications of, the technology they use, for instance in terms of privacy, security, or cybercrime?
- ix. *Legal and Regulatory Framework*: How do laws and regulations affect use of technology and what changes are needed to create an environment that fosters its use?
- x. *Local Economic Environment*: Is there a local economy that can and will sustain the use of technology?
- xi. *Macro-Economic Environment*: Is national economic-policy conducive to widespread use of technology, for example, in terms of transparency, deregulation, investment, and labour issues?
- xii. *Political Will*: Is there political will in government to do what is needed, to enable the integration of technology throughout society?

5- ACCESS: THE PAKISTANI PARADOX

Having touched upon the definition of 'real access' and what it requires, we come back to the original paradox of Pakistan in the lop-sided diffusion of ICTs. The military government, during its inception period in 1999, declared IT as one of its four focus- areas and since then made a substantive investment to put in place infrastructure for ICTs and support projects. The present political government has followed suite. This has resulted in some remarkable developments:

- From a mere 29 cities in August 2000, Internet is now available in nearly a thousand cities and towns, almost every town, in the country. To boot, one can access it from all these places with a local call that is not metered. No doubt, there still are major problems in connectivity and quality of service, but this marks by far the most extensive Internet-coverage in South Asia. This is also borne by the data given in the Table-1, which is somewhat dated. If anything, Pakistan's pre-eminence in Internet-connectivity, among the countries of South Asia, would be more pronounced now.
- The rates for Internet-bandwidth has been slashed down, by about 15 times, during the last few years, making them the cheapest in the region. This has promoted a thriving ISP-market, though it has not grown according to the earlier projections for some of the reasons that we discuss later.

In short, *Pakistan has the most extensive Internet-coverage in South Asia, and arguably the cheapest rates for the provision of Internet Service*. However, from the standpoint of *real access*, based on need and innovative applications that could make a difference to the lives of common people, especially those in the rural areas, there is hardly anything to show for. In terms of grass-root ICT-projects, generally referred to as ICTs-for-development (ICT4D) projects, Pakistan has yet to present a good example that could be replicated, on a larger scale, in the country and elsewhere in the developing world. While it may come as a surprise, but in this respect, Pakistan even lags behind Bangladesh and Sri Lanka, not to say India, which can boast of dozens, if not hundreds, of such initiatives.

Table - 1: Diffusion of Telecom, Computer and Internet in South Asia

Per 1000 People

Countries	Telephone Mainlines	Cellular Phones	Personal Computers	Internet Users
Bangladesh	3.4	1.2	1	0.2
India	26.6	1.9	3.3	4.5
Nepal	10.6	--	2.6	1.4
Pakistan	22.2	2.1	4.3	8.5
Sri Lanka	36.4	12.2	5.6	3.4

Source: International Telecommunication Union (2000), Nua Internet Surveys (2000), ADBI working paper (Jan, 2001)

6- SOME EXAMPLES OF ICT4D PROJECTS

Based on the criteria of real access, we look at some representative examples of ICT4D projects, all barring one from the South Asian Region.

6.1 Radio Browsing in Kothmale, Sri Lanka

One of the most innovative projects of its kind, it combines the grass-root outreach of a community-radio with the great knowledge-potential of the global Internet⁸. People in the communities with access to the FM community-radio – incidentally the first of its kind in South Asia – send their queries to the radio-station, through ordinary post, on different issues, such as, health, agriculture, crop-production, pesticides, legal problems. The answers to these queries are generated by programme-hosts or volunteers, through Internet searches. They translate this information in the local language before broadcasting it on the radio. Internet is also utilised by the radio-announcers who often incorporate information, news, weather reports and music into their broadcasts.

It is a joint project of UNESCO and the Government of Sri Lanka. UNESCO basically caters for the cost of Internet-connectivity – a 64 kbps line – to the three Internet Centres, in addition to the initial grant for computers. Apart from one in the radio-station, the other two are located in the Public Library and Town Hall. The Internet-Centres also provides the local community with direct computer and Internet-access – there were no Internet access points in the area previously. With this facility now available, many people in the community now contribute to the Internet-Broadcasts, by researching and translating, and by

directly participating in radio-programs. The three access-centers keep in touch via email and share information, which is then posted on boards for all of the community. The services have now been extended to a database of all the information and programmes that have been broadcast, and have become quite popular in the community.

6.2 CorDECT WLL

Pioneered by Professor Ashok Jhunjhunwala, a researcher at IIT, Madras, the corDECT WLL (Wireless in Local Loop) provides a complete wireless-access solution for new and expanding telecommunication-networks with seamless integration of both voice and Internet-services. It is the only cost-effective WLL system in the world today that provides simultaneous toll-quality voice and 35/70 kbps Internet-access.

At the same time, under the banner of N-Logue Communications, the creators of this product have come up with an innovative franchise-based business-model to enable rural connectivity. *N-Logue Communications* offers in the rural areas and small towns a kiosk with corDECT Wireless terminal, telephone instrument, 100 MHz Pentium PC (with colour monitor, local language word processor, browsing and e-mail software) with a 16 hour power back-up for telephone and 4 hour back-up for PC. In addition to this, an STD PCO meter is provided in public kiosks.

N-Logue was incubated by the Telecommunications and Computer Network (TeNet) Group of the Indian Institute of Technology in Madras as part of the institute's strategy for developing and disseminating innovative, affordable communication technologies to

the rural poor of the developing countries. The initial results of both the technology as well as the business model have been quite encouraging⁹.

6.3 Wind-up radios for communities

Much of the developed world drowns in data from the Information Superhighway. Yet in developing countries, most have never made a phone call and few have ever switched on a computer. Radio remains the world's lifeline. The Freeplay Foundation, UK,¹⁰ has a mission to enable sustained delivery of radio-based information and education to the most vulnerable population-segment, via self-powered radios ('*Lifeline*' radios). Working mostly in Africa, where affordable energy is scarce or non-existent, the Freeplay Foundation collaborates with professionals in education, health, agriculture, peacemaking, and voter education – all sectors where radio can play a vital or even life-saving role. The three main components of this initiative are: appropriate content, hardware (Lifeline radios) and structured distribution of these radios. An additional component that has crucially contributed to success of the project has been an extremely effective system for monitoring and evaluation.

This example of an ICT4D project is particularly relevant for a country like Pakistan, for it not only takes care of the issue of local content, but also solves the problem of electrical power.

6.4 Simputer

Simputer, a short form for *simple computer*, is a low-cost portable alternative to PCs, designed in India for affordable computing needs of the poor¹¹. It is yet to be tested out on a mass-scale, but holds great promise for bringing the benefits of ICTs to the common-man.

It has a special role in the Third World because it ensures that illiteracy is no longer a barrier to handling a computer. The key to bridging the digital divide is to have shared-devices that permit truly-simple and natural user-interfaces, based on sight, touch and audio. The *Simputer* meets these demands through a browser for the *Information Markup Language* (IML). IML has been created to provide a uniform experience to users, and to allow rapid development of solutions on any platform.

The projected cost of production of the *Simputer* is about Rs. 9,000 produced, at large volumes. While this may still be beyond the means of most citizens, in countries like India, the *Smart-Card* feature that the *Simputer* provides, enables it to be shared by a community. A local community such as, the *village-panchayat*, the village school, a kiosk, a village postman, or even a shopkeeper could be able to loan the device to individuals, for some length of time and then pass it on to others in the community. The *Simputer*, through its *Smart-Card* feature, allows for personal information-management, at the individual-level for an unlimited number of users.

The impact of this feature, coupled with the rich connectivity that the *Simputer* provides, could be dramatic. Applications in diverse sectors, such as, micro banking, large data collection, agricultural information and as a school laboratory, can be made possible at an affordable price.

6.5 Other Examples

In addition to these examples, we could cite a number of others that have contributed to the betterment of the life of a common man in South Asia.

One of the most participatory and thoughtful initiatives in the field of ICTs has been the *M. S. Swaminathan Research Foundation Rural Tele-Centers* in Southern India¹². One of their tele-centers, for example, downloads weather-reports and other information and translates those into the local language, to be broadcast through a loudspeaker, where fishermen embark for the sea. This has reportedly saved a number of lives by providing advance warning, to the fishermen about storms in the sea.

*Gyandoot*¹³, an award-winning project in the Dhar district of Central India, connects 39 information-centers, set up in different villages, through which information on crop prices, welfare services, domicile certificates, land ownership certificates, etc., are made available.

The *Bhoomi* Project, in Karnataka¹⁴, is one of the brightest e-governance projects, with regard to financial sustainability and it is now being replicated in other states of India. It has computerized more than 20 million records of land of the Karnataka farming

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community, and can provide that records of: Rights, Tenancy and Crops; and mutation certificates within a few days, for only 15 rupees each. About 400,000 records have been issued every month since its inception, and the state is earning something like 7 to 7.5 million rupees each month.

The Grameen Bank's *Village-Pay-Phone Project*, in Bangladesh¹⁵, is another good example of sustainable ICT-solutions that can be used for the poor. Through this project a selected number of village-women are granted a revolving loan in a Village-Phone- Package and the women are encouraged to run phone-centres, at their respective villages, where other forms of communication are unavailable or costly. Customers are charged both for sending and receiving calls and the phone-set being a cellular, mobile phone, so light to carry - can be used by the whole community. Apart from providing a useful service to the community, this has resulted in earning a decent income for the 'phone-ladies', thereby, also enhancing their social status.

7- BASIC FACTORS INHIBITING THE GROWTH OF ICTs IN PAKISTAN

The reasons for Pakistan's lack of success in adopting ICTs, to bring about a meaningful change in the lives of common people of the country, are not too difficult to fathom. When we consider ICTs, and especially Internet as a development tool, we are up against some very fundamental barriers. Briefly listed, they are:

- *Poor Literacy Rates:* Pakistan's literacy-rates are among the lowest in the region. And when it comes to the ability to read and write English, hardly a few per cent of the population is able to do so. Internet is still predominantly a text-based medium, most of which is in English. It requires someone, with at least an elementary knowledge of English, to benefit from it. That leaves out an overwhelming majority of Pakistanis, especially in the rural areas, from the ambit of this revolutionary medium.
- *Poverty:* With grinding poverty that has further exacerbated during the decade of the nineties, very few Pakistanis can afford the luxury of owning a computer with an Internet connection. Compared to radio, and even television, computer is significantly more expensive. While cyber-cafes

mitigate this limitation to a certain extent, they exist only in urban areas and are still beyond the affordability of the poor.

- *Low Tele-density:* Pakistan's tele-density is abysmally low, at around 3%, which is yet another impediment in the mass diffusion of ICTs. While the latest surge in mobile-telephony has improved the situation to a certain degree, it is yet to make a significant difference.
- *Unreliable Electrical Supply:* Even though the rural electrification schemes have brought most of the country under the power grid, the electrical supply is at best intermittent. There are long unscheduled outages, and in many places, the electricity is available for only a few hours. Such a situation is patently discouraging in building an ICT-infrastructure that reaches out to the general populace. If nothing else, it hikes up the cost of such facilities, which for poor rural areas become all the more unaffordable.

In the face of such formidable barriers and basic problems, it is unrealistic to expect an easy or speedy solution. It would require a consistent effort and investment over a long period of time, to alleviate the situation. However, ICTs can themselves be employed in a thoughtful and innovative fashion, to accelerate this process of change. We now have good examples from around the world – some of which have been discussed above – to have a greater confidence in achieving this goal.

8- WHAT IS TO BE DONE?

Before we go on to recommend specific measures for moving out of the Pakistani paradox, we need to have a better understanding of its causes. While we have already discussed the fundamental structural problems in the diffusion of ICTs in the country, we now take a brief look at the issues impeding ICT4D initiatives in the country, and how they could possibly be tackled.

- *Lack of Awareness:* There is not enough focus on ICT4D among the policy-makers. To be able to launch such initiatives, there should be a greater awareness about the potential of ICTs as a development-tool, at least among the

development-practitioners. Ideally, those in the field should have the skills to set up basic applications of ICTs, but if that were not possible, they should have a good understanding about where these technologies could be employed, their scope and limitations.

- *The Challenge of ICT4D:* The challenge of using ICTs, as a development tool, is enormous and goes much beyond the thinking and efforts required for setting up telecom-infrastructure, or using off-the-shelf hardware and software. Such initiatives have to be need-based and require participatory and innovative approaches. An unthinking technology-input, often based on the hype created by technology-vendors, can't be expected to cater for development-needs that are generally specific to a particular community.
- *Language and Cultural Barriers:* While it's easier to understand the language barrier – no matter how useful the content, if one can't understand the language in which it is presented, it has no value – the cultural barriers are sometimes more subtle. However, they are equally important and could at times present a greater barrier than trying to learn a new language. A good example, of which we are all too familiar in Pakistan, is the strong inhibition among women to visit cyber-cafes, frequented by young men often for activities that our society has zero tolerance for women to be associated with.
- *Not Commercially Attractive:* Unlike laying vast infrastructure or the *computerization* of government-agencies, or setting up large networks in universities, ICT4D projects, by their very nature, are generally not found to be attractive from a commercial point of view, even if they can be designed to be sustainable. The main reason for this state of affairs is that the technology-vendors are mostly selling foreign technologies – alien to the needs of the common people of Pakistan – without the necessary indigenization required to work in a different milieu with its paramount needs. So at times, it is more a manifestation of a lack of technological capacity than a lack of commercial potential in the project. The examples of both *corDECT WLL* and *Simputer* listed above, reinforce this point.

Once we have a good basic understanding of these inhibiting factors, we can come up with appropriate solutions. Given the cross-cutting nature of these technologies, we would need to work simultaneously in many areas to get the desired effect. For example, let's take the case of e-commerce. Policy-reforms to promote e-commerce should be accompanied by necessary legislation and regulatory framework, to carry out such transactions, accompanied by appropriate research and development, to create user-friendly software and necessary capacity-building to use these tools.

This would also require a *holistic approach* that entails looking at the larger picture with deeper understanding of the use of ICTs by different sections of the society, taking into account socio-cultural factors, like literacy and gender to encourage inclusive and partnership oriented initiatives. Government, civil society – especially in the form of social entrepreneurship – along with business and local philanthropy should come together to form partnerships, to explore ICT4D initiatives that could be appropriately scaled up.

In a nutshell, for an effective use of ICTs, *connectivity, content and capacity* are all equally important. This requires not only infrastructure, but development of locally relevant content - preferably in national and local languages – the skills to access this content and the ability to contribute towards it.

In remote areas, where the supply of electricity is especially problematic, greater use should be made of battery-operated ICT-equipment (such as: laptop computers and palm-style computing devices) and alternative electrical systems (e.g., solar powered and bicycle powered systems).¹⁶

Making use of this forum, we would like to make a couple of proposals that are eminently doable and can go a long way in providing a kick start to the ICT4D enterprises in Pakistan.

- *ICT4D Academy:* This is not being proposed as a brick-and-mortar institution, but as a mechanism for bringing together development-practitioners and ICT-experts, to try to come up with need-based, innovative applications of the technologies for the common man, especially in the rural areas. The members of this 'academy' could meet once

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or twice a year, with smaller select-groups, working on joint projects, meeting more frequently. Since face to face meetings between geographically distant people are difficult to arrange, the discussions could be continued through email, Internet-based discussion-forum, online-chat or voice-communication if required. Apart from this research and development work, the members of the academy can also be asked to conduct awareness raising seminars or training in various aspects of ICT4D.

- *Basic Urdu software-tools in the public domain:* The current situation with regard to basic Urdu software – word processing, email, html editing and database-management – is not conducive to its use on a mass-scale. While these tools are available, they are quite costly for a common man. More importantly, despite a standard being promulgated by the government, with regard to Urdu informatics, it is yet to be followed by commercial software houses developing Urdu-software. As a result Urdu-software tools created by different vendors are mutually incompatible. What is required is to have these basic tools – conforming to the standards – made available in the public domain. Since some of these tools, developed by students and amateurs, already exist, what is needed is to review them for suitability, plug the gaps in their functionality and place them on Internet for downloading. Apart from the technical input, this project would require a good deal of coordination and communication, to reach out to all potential users of tools of Urdu-software.

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