Ownership of Problems, Intellectual Property and the Digital Divide ---The Enabling Challenge of Solutions

by

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[*] This address is dedicated to fellow New Yorkers and the other people from around the World who fell
victim to the attacks of September 11, 2001

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Dedication

With your indulgence, I would like to dedicate this contribution to the memory of my fellow New Yorkers and all those others from around the world, who lost their lives in the attack on New York and elsewhere in the United States last week on Tuesday, September 11, 2001, and to pray for speedy recovery of those who were physically and emotionally injured and traumatized by that tragedy. Our heart also goes out to all others who have experienced similar tragedies elsewhere around the world at various times. May our little efforts here at bridging the digital divide contribute, even if in a small way, to bridging the divide of human faith, goodwill, mutual respect and understanding, as well as affection, which continues to deny us the peace and promise of the global village we all so desperately crave.

Introduction

First, I would like to thank the Director General and staff of the World Intellectual Property Organization (WIPO) for the invitation to address this august gathering. There is a certain style and equanimity about WIPO which makes its appeal irresistible. I have often wondered whether this comes from the notion of "Intellectual" in its name, from "Property" and the sense of wealth it conjures, or the sense of absolute power and authority over the minds and properties of the global community implicit in the entire name, "World Intellectual Property Organisation." Whatever it is, which is clearly captured in the grandeur of its headquarters building across the street, it is good to be here and to have the priviledge of sharing a few ideas about electronic commerce and intellectual property, specifically about the opportunities, yes, opportunities, offered by the so-called digital divide.

The challenges of the digital divide and its collateral obstacles offer the people of the developing world a unique opportunity and premise for jumpstarting the process of advancing their global competitive capacity building vis-à-vis the industrial world. They can do so by unleashing their intellectual capacity, already enormous and cutting edge, to

find unique and dedicated solutions to the limitations which stand in the way of their taking command of the facilitations of information and communications technology, and deploying such solutions with utmost skill and dexterity to meet their self-determined goals of individual and communal self-actualisation. In the process, they will optimize the prospects of creating innovations that will accrue the benefits of intellectual property, the most valued assets of the New Economy.

Problems as Opportunities

Somewhere between my worldview and my mind frame, I have always seen problems, first and foremost, as opportunities. We must all agree that problems have been part of human existence from our earliest beginnings. In addition to enabling us appreciate and enjoy the charm and beauty of nature and mankind alongside it, to manipulate aspects of our lives and environment, and to master and appraise life and the experiences it engenders, our intellect has always been configured to sense, identify, define and seek to solve the challenges of life and humanity represented in problems we are compelled to cope with.

Accordingly, much of our intellectual pre-occupation has been with problem-solving. This is not only the foundation of our educational process, but also a major part of our social, even romantic behaviour and interaction. The history of man is essentially the history of man's confrontation with challenges and the legacy of success and failure we have achieved in meeting them. This is not only in the sciences and in technology, but also in the creative, performing and liberal arts, as well as the humanities and other areas of human intellectual exercise. The history of science is the annotated stream of innovations in response to problems. The evolution of the arts is a solid testament to our manipulation of the tools of material and mind as we seek new ways of expressing our thoughts, emotions and the inner depths of our spirit and being.

Coming closer to home, if we care to chart the course of each day in our lives, and classify the activities with which we occupy ourselves, so much would be problem-solving that if we were to exclude problem-solving from our daily routine, we would be left with a major void and its attendant boredom and disorientation.

The Ownership of our Problems

If the above postulation is true, even if mildly so, then we must uphold and defend what I call "the ownership of our problems". If creativity and innovation most significantly evolve from the process of problem-solving, then we must protect the right of ownership of our problems as a pre-requisite for protecting our ownership of (and access to) the opportunities for creativity and innovation, through creating solutions to our problems. To do so is to protect the right of access to the compelling enabling circumstances for the development of intellectual property. I recognize that this vastly expands the scope and definition of intellectual property. In fact, it more than doubles its territory since there are more problems in this world than we can find solutions for them, which is as it should be in order for us to maintain the differential that constitutes the force that drives innovation.

Besides the ownership of a problem, the definition of a problem and the parametres of its solution are also very important. The one who defines a problem defines the corresponding environment for the search for a solution, and ultimately the indicators that constitute a solution. Implicit in this are issues of solution for whom, for what, and by whom? If the definition of your problem is external to you, and the indicators of the desired solutions equally beyond you, then chances are that the solution would be irrelevant to you, with the serious possibility of causing new problems for you, in addition to those that you set out to solve in the first place.

Implicit in my thesis of the right of ownership of our problems is the suggestion not only that problem-solving is empowering, but also that having problems, the pre-requisite for problem-solving, is an asset. This is essentially true. There are, of course, issues of the plethora of problems or problems of such intensity that they overwhelm our problem-solving resources and capacity, threatening to undermine or rout us. But let me short-circuit my vulnerability here by simply stating that these sets of problems pose a different sort of challenge, which would require a different forum to address!

I have maintained that the right of ownership of our problems is important because in it lies the challenge to creativity and innovation, and the prospects of the creations and accompanying intellectual property that derive from solving or attempting to solve them. If you steal my problems, you create two problems for me: You deprive me of the compulsion and opportunity to create and innovate; and you leave me with the perpetual guilt of incompetence, abandoned to the debilitating self-perception of being a ne'er-do-well. I have inserted value for even a failed attempt at problem-solving, because more often than not, the process itself produces collateral innovation or creativity which not only enriches the pool of human knowledge, but might become direct solutions to problems yet identified, or offer pre-emptive solutions in anticipation of future problems.[1]

Ownership of Problems, Intellectual Property and the Digital Divide

This is precisely the environment of the disabilities and disadvantages of the developing world in having access to, and taking advantage of the facilitations of the versatile and near ubiquitous capacities and applications of information and communications technology---what we call "the digital divide."

Definitions

There are different aspects and configurations of the Digital Divide, and understanding them might be instructive:

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[1] Joseph O. Okpaku, Sr., *E-Culture, Human Culture and In-between: Meeting the Challenges of the 21st Century Digital World,* ITU Conference on "Creating New Leaders for e-Culture, Coventry, UK, August 20-24, 2001.

The Infrastructural Digital Divide

The *Infrastructural Digital Divide*, which is what most people mean when they use the expression "digital divide", refers to the vast differential in the extent, quality and versatility of information and communications infrastructure and networking capacity between the industrial world and the developing world. This differential exists not only between, but also within, regions and countries, and even within cities and local communities. The infrastructural digital divide mirrors, approximately, the patterns of wealth in society, and the correlative distinctions of demand, affordability, and political, social and economic clout required to drive the new process from demand to access.

There is general consensus as to the nature and topography of the infrastructural digital divide. This is not likely to be the case when we come to other aspects of the digital divide.

The Information Digital Divide

The *Information Digital Divide* is the vast differential not only in the access to information and data, but in the ability to put a spin on both and post them on the global tableau as the predominant information and interpretation of facts and events. This definition is deliberately loaded with subtle implications because it seeks to challenge commonplace assumptions. While digital transmission capacity greatly facilitates the process of accessing and transmitting information and data, it does not, *per se*, bestow accuracy or authenticity to such information (or data, for that matter), and definitely has no intrinsic correlation with truth, value or meaning. In fact, the enormous ability of digital network capacity to manipulate information is such that, more and more, it appears to be fast becoming inversely proportional to truth, authenticity, value and meaning.

The disproportionate nature of this ability by one sector of the world to post myopic information duly vested with self-interest-motivated interpretation, and its own spin on facts and events, especially where the interests of others are at the core of the issues at stake, makes the asymmetrical nature of digital capacity a serious threat to the value of information in the global arena of complex and often conflicting perspectives, perceptions and purposes. It also most often blanks out the information from a major proportion of human society. Given the complex inter-relationship between information and fact and knowledge, such a distortion of perceptions and perspective can made the digital divide a disadvantage to all sides. The gap between what the media-rich believe and tell the world to be the truth, and what the digitally disadvantaged believe, cannot express but can act on, exacerbates rather than ameliorates conflict. In fact, the very inability of the digitally-disadvantaged to tell their own story to the jury of the world creates an intense sense of injustice and deprivation, which often compels a resort to intransigence as a generalized protection against the machinations of the media-powerful. The problem gets even more serious when we migrate to the more complex issue of knowledge.

The Knowledge Digital Divide

The *Knowledge Digital Divide* is the differential in the access to, mastery of, and capacity to meaningfully deploy knowledge. Contrary to popular assumption, the topographies of the knowledge divide and the information divide are sufficiently dissimilar to render any assumed direct correlation untenable. There is a major difference between information and knowledge, and the value of both.

I have said in the past that "too often, *information* and *knowledge* are used as if they were synonymous. This confusion inhibits our ability to address the true nature and challenge of our knowledge society. *Information* is simply a body of facts and data, with no compelling intrinsic value or meaning. *Knowledge,* on the other hand, is the crystallisation of lessons learnt from the study or experience of the phenomena of history. Knowledge derives from culture; the history of knowledge within a culture becomes *civilisation*. Knowledge therefore embodies not only the mastery of the phenomena of life and man's innovation, but the ethics, morality and traditions of a given society and its culture.

Access to information, while an important component of acquiring knowledge, does not in itself constitute learning. This would suggest severe limitations in the power we implicitly grant to Internet access as the magic tool of transforming society. It must be remembered that the essential value of Internet access is the ability to access much larger chunks of information much faster and, hopefully, much more easily." [2]

In the digital age, this presumption of information as being synonymous with knowledge has led to classifications of capacity along regional and ethnic lines, which do not hold up to the barest critical analysis.

In fact, we might be witnessing an emerging by-product of our information age. It is beginning to increasingly appear that the more information we have, the less is our ability to understand, to reflect and to apply the value previously implicit in the acquisition of information. In mathematical terms, in our digital age, information might be becoming inversely proportional to knowledge, or $IxK=C$, a constant. This is not to glorify the disabilities of the digitally disadvantaged, but to draw cautionary attention to the fast growing global decline in our intellectual capacity by virtue, ironically, of being overwhelmed by the deluge of disaggregated and critically undifferentiated information and data. This portends corresponding emotional, social and intellectual implications for all of us as individuals, and strategic implications for society at large.

Information confused for knowledge has the potential to undermine intelligence and perpetuate ignorance. Furthermore, the confusion of one for the other has led dangerously to a vast underestimation of the knowledge capacity of the developing world, and the corresponding presumption of a deficit in its global competitive capacity. When we add

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[2] Joseph O. Okpaku, Sr. *Designing Knowledge Societies: Challenges & Opportunities,* the ASEAN Regional Workshop On Building Knowledge Societies, Kuala Lumpur, Malaysia, Jan 26 – 27, 2000.

to this the parallel erroneous assumption that the self-evident infrastructural digital divide with the developing world at a disadvantage means a non-functional deficit in knowledge and the capacity to deploy it meaningfully, our perception of the global disposition and the compelling approaches to creating a global knowledge and capacity equilibrium becomes blurred.

There are also multiple levels of the knowledge divide: the different levels and approaches of knowledge of the same things; the knowledge of different things according to the differing intellectual, social and cultural paradigms of various societies; and the different philosophical, ethical, existential or strategic relationships between what is known and its relevance to life and its meaning.

The Intellectual Digital Divide

Intellectual capacity is essentially the ability and wherewithal to acquire and manage information, analyze experience, and draw on existing knowledge, and combining all these processes to create new insights and knowledge, thereby enhancing our ability to cope with the challenges of life and to enrich human culture. The differential in this capacity, especially as it relates to the role of digital capacity in the process, constitutes the *Intellectual Digital Divide*. Here, again, the topography is not along traditional contours of industrial versus developing societies, popular wisdom notwithstanding.

The Human Resource Capacity Divide

Directly related to this is the *IT Human Resource Capacity* Divide, or the differential in the expert capacity, especially at the cutting edge, of societies to acquire, master and manipulate the enabling tools of Information and Communications Technology to facilitate the management of life, the conduct of human interaction across vast distances, and the creation of innovations to solve the material and intellectual challenges to quality existence. While the ability of societies to derive maximum benefit from digital innovations depends on how widespread such capacity is, the critical Digital Human Resource Capacity of any society at the level of creating dedicated innovations and solutions need only consist of a core of cutting edge expertise to jumpstart the process of creating solutions to bridge the digital divide. It is with this strategic core of experts to mastermind the research and development initiatives to find solutions and create corresponding applications, and the facilities with which to do so in terms of research laboratories, that lies the problem-solving capacity of any given society, and the corresponding capacity to create intellectual property, itself the key asset of the New Economy.

Significantly, the topography of the ICT Human Resource Digital Divide cannot be drawn along any traditional lines of nationality, race or economy, because the earlier globalisation, the globalisation of education, brought together peoples from around the world to the centres of excellence in IT research and development. Today, it is an understatement to say that a major source (by no means all) of the scientific and engineering expertise driving the innovation and creating the solutions which drive the

New Economy comes from experts from the developing world working at academic and research institutions mainly in the industrial world. The ownership of IT expert capacity, therefore, cannot be comfortably asserted to be the preserve of the industrial world.

This is important as we proceed to try to chart a course for the developing world to take the lead in bridging the digital divide, which accrues vast disadvantage to it, by taking ownership of its IT problems, deploying its globally competitive expert human resource spread throughout the world, and creating the applications and solutions needed to do so, and thereby creating intellectual property in the process. This is the core of my thesis here this morning, and the challenge I wish to pose to the developing world at large, and the industrial world which, complementarily, constitute our global environment. But before we begin to synthesize our solutions paradigm, and also for purposes of completeness, let us look at a couple more components of the digital divide.

The Cultural Digital Divide

At the risk of brushing up with potential intellectual sacrilege, I would state categorically and without prevarication, that all science and technology is culture-based. More bluntly in the limited time, the computer is a western machine. As a binary machine, it is based on black and white, on and off. It derives from a culture which believes very much in simplification, often equated with bluntness, directness, clarity and more. This cultural attribute might itself be the result of the long-running battle between the culture of science and technology, on the one hand, and human culture, on the other hand, with technology fighting relentlessly to become a culture in its own rights, rather than a tool to be controlled and managed with dexterity to serve the pre-eminent needs of human culture.

For much of the developing world, at least in the African culture for which I have a right to speak, the intellectual process, the culture, expresses itself more in shades of grey. Things are not black and white. They are not as categorical as they seem. This dichotomy is fundamental to the crisis of the battle to impose one culture on all the others, whether through the mass media, international rules and regulations, the control of international organisations, world trade and such other processes, all of which are implicit components of the thrust of globalisation. If this suggests that there may be a need to visit the design of the computer, the basis of digital technology and the Network society, with a view to creating a more equitable family of computing technologies to more accurately reflect the true range of human intellectual and reflective process, my response is: yes.

Such a move, which could piggy-back on the development of intelligent computing, by broadening the scope, the definition and theoretical paradigms to more seriously include scholars and scientists from the developing world, would not only increase the prospects of a more efficacious response to the challenges of human development, but hold the promise of unleashing a wealth of new insights and innovations, which would enliven and boost the creative process in IT into new orbits. Such an approach will bring everyone to the same laboratory of research and create a global collaboration in IT research and development which, by including the vast majority of the world's

population and addressing their interests, can give IT the large space it needs to handle its enormous scope. Not to do so is to condemn the industry to the limitations of saturation, which its myopic vision has already encrusted around it, with the corresponding market absorption problems it currently faces.

 The Content Digital Divide

The *Cultural Digital Divide*, the result of the ethnocentricity of the digital world, reflects itself in the asymmetry of content carried in the pipes of global digital networks, resulting in what we might call a *Content Digital Divide*. Rectifying this deficit will not only help overcome the limitations of a modern world, which increasingly has a diminishing truly global perspective, but could, through a concerted effort to globalize content with the multiplicity of perspective and culture inherent in such a process, become a source of much innovation for the IT industry.

The Digital Opportunity Divide

The hoarding of the right of ownership of the challenges of IT technology by the industrial world, by overwhelming the developing world with its solutions, creates a differential of opportunity to address these challenges with a view to creating solutions through innovation. This creates a *Digital Opportunity Divide* between the industrial world and the developing world, with negative consequences to both. The globalisation of content development is one of the ways to bridge this gap, and create benefits for all through the development of a more diverse plethora of new applications and contents.[3]

The Opportunities of the Digital Divide

A collateral aspect of the digital opportunity divide is the fact, understood most easily in the context of supply and demand economics, that the vast absence and inefficiencies of the information and communications environment in the developing world constitute an enormous demand, the supply of which becomes a great market for the creation, manufacture, supply, management and maintenance of the complete spectrum of technologies, services and applications. Such a situation is the lightning rod for businesses. If the developing world rises to the challenge of developing its own industrial and business capacities in ICT, and has the courage to accept responsibility for evolving solutions to what is primarily its own problems, then the digital divide in all its variations constitutes the most exciting opportunity for industrial development for the developing world.

Bridging the Digital Divide: Opportunities for the Developing World

We have tried to define the challenges of the digital divide, identified the building blocks for meeting these challenges, and implicitly asserted that the resources for bridging the

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[3] There are other aspects of the digital divide, some real; some apparent, and some virtual, the analyses of which will contribute to a fuller understanding of the challenges of the digital divide and how to bridge it. But these can be addressed in a different setting.

divide exists in sufficient abundance, primarily in the domain of the developing world itself. Let us now synthesize all these components to craft a practical and efficacious solution, based on the paradigm we have established: namely, the ownership of the problem; the opportunity implicit in problem-solving (including the prospects of the development of intellectual property); and the benefits to all of us in what I believe to be a win-win situation for everyone. In the process, I will outline the strategies, that we at the Telecom Africa Corporation have put, and are putting, in place to address these challenges, thus building the global competitive capacity of the developing world in ICT in the process.

Claiming Ownership of the Problem of the Digital Divide

The challenge of the digital divide is primarily presented as the problem of the developing world. On the basis of my thesis that problems constitute essentially opportunities for innovation, we should accept the digital divide as our problem, and claim the right of first refusal for solving it. Of the various components of this challenge we have identified, let us focus on three primary ones for solution: the infrastructure digital divide; the intellectual and human resource divide; and the cultural and content divide.

Infrastructure

The major challenge of infrastructure in bridging the digital divide is a combination of appropriate technology and cost. In spite of the accomplishments of the last decade, the vast populations of the developing world still do not have access to the facilities and benefits of information and communications technology. What exists in many places is grossly inadequate and most likely not upgradeable to benefit from new and emerging technologies and applications.

The Obstacle

Externally, a major obstacle to building adequate digital infrastructure in the developing world is the persistence of the IT industrial companies in keeping the cost of infrastructure artificially high despite innovations in technology, and the failure of the developing world to challenge them. Instead, they sit helplessly, confining their response to seeking more and more loans and grants to meet these costs. Internally, the leaders and decision makers in much of the developing world, many with backgrounds in the liberal arts and social sciences, continue to see technology as magic, as, if you would excuse the expression, "White man's magic", and therefore something well beyond the capacity of their own people, no matter how talented and educated. Not even the fact that they do not have the money to buy expensive infrastructure has compelled them to seriously explore turning to their own experts and budding industries and challenging them to develop or deploy their industrial capacity to build such badly needed infrastructure.

Innovation is only justifiable if it delivers goods and services better, faster, more durably, and cheaper. The delivery of alternative technologies for building ICT infrastructure to

the developing world has not shown significant cost savings, promotional claims notwithstanding. This is partly because the developing world is perceived as having no alternatives to buying whatever is offered. Not so.

Bridging the Digital Divide: The Solution

The infrastructural needs of the Developing World demands a comprehensive, coherent, and dedicated initiative to design new technologies or reconfigure existing technologies to build infrastructure at affordable prices. We must start the process by a clear notion of what is reasonably affordable cost, use that as the engineering challenge, and set out to meet it.

At Telecom Africa, we believe that affordability is an engineering issue. "If a man has a hundred dollars and a problem," we say, "you give him a thousand-dollar solution, you have not solved his problem. You have merely increased his problems. He must now figure out how to get the additional nine hundred dollars." The challenge is to find a maximum hundred-dollar solution (ninety dollars, if possible), one which at the same time meets the critical requirements of being robust, expandable and upgradeable, versatile, and responsive to the specific (if not peculiar) demands of the local environment and conditions, and to local usage culture.

To do this will require indigenous capacity to undertake research and development, the laboratory facilities for design, production of prototype, in-house and field testing, manufacturing, delivery, installation, quality control, marketing, maintenance and upgrading.

Although an automatic knee-jerk reaction would be to declare that research and development is very expensive and that poor countries cannot afford it, the fact is that, first and foremost, the cost of investing in research and development to produce and install affordable infrastructure is far less than the cost of paying for far more expensive imported equipment, especially where such equipment, having been designed for an alien environment, does not deliver but a small fraction of its designed capacity before it becomes obsolete.

This approach throws other challenges at the developing world. How indeed can we achieve affordability while aiming at cutting edge innovation? Here are some answers.

Cross-Border Cooperation

We hardly explore regional collaboration, which would reduce cost through the economies of scale implicit in the wider deployment of such indigenous technology. What prevents two or three countries in a region from combining their infrastructural needs in return for obtaining better technology for less, especially since such affordable technology will reduce the need of the participating countries to go out looking for more money to borrow, with more interests accruing to haunt them in the future?

Local Manufacturing

Local manufacturing, especially given our relatively much lower labor costs (even if we paid salaries well above local rates), will bring down the cost of equipment. The critical components of today's equipment, the electronics (mostly chips), can initially be imported with little effort, with plans to develop their local production whenever the engineering environment and economics make it prudent.

Such local manufacturing creates significant other benefits, such as local job creation for engineers and scientists at home and abroad, a critical capacity to drive the overall quantum leap of the indigenous economy to higher levels of performance much needed to bid poverty goodbye in the developing world.

Research and Development

The research and development activity itself, being the domain for innovation, holds the promise of stimulating the creation of intellectual property in the form of patents, themselves amongst the most valuable assets of the New Economy.

Many Departments, One Solution

One does not expect much of a battle if one asserts that a major problem of the affordability of digital access (and other infrastructural needs) of developing (if not all) countries, is the wastefulness entrenched in archaic administrative structures set up by colonial powers whose objective was not so much to achieve productivity as to prevent indigenous creativity and capacity building. Many of these debilitating institutional structures and procedures remain extant. Most devastating amongst them is the intensity with which various departments and Ministries jealously guard what they presume to be their independence. Most often, we see each one of them seeking to borrow money to build their own networks, which they cannot afford.

Shared Networks

Such needs would be eminently more feasible if a common network is designed to meet the needs of a large number of institutions, with the special needs of each institution forming a component of the omnibus network. The combined resources of several institutions can together go a much longer way to financing a combined network that meets all their needs and still provides the separation and security each party needs.

Convergent Infrastructures: The Mega-Infrastructure

Another innovative approach to facilitate the building of affordable infrastructure for IT is to adopt an approach one might call "convergent infrastructures". Increasingly, various utilities are converging---information, telecommunications, power and energy, water, sewage, transportation, and more. Each of the infrastructures required to deliver these services has a basic component of its cost, irrespective of the cost of equipment. At

Telecom Africa, we believe that time has come for the developing world to take the innovative approach of designing a mega-infrastructure to deliver all its utilities. Besides the tremendous cost savings this promises, it will enable the developing countries that do not have much value in heritage infrastructure to dump the burden of their existing money-guzzling, service-depriving infrastructure for a new, robust, versatile, mega-infrastructure of the future. We would be glad to talk to those interested in such an approach to a Brave New Technological World.

Both require fundamental changes in paradigm of governance to allow collaboration. We must make a choice between protecting our petty independence as department heads of ministers and staying poor with no prospects of uplifting our societies, or trading in such intangibles for the immense benefits of coordinated infrastructure, which will allow all of our departments and ministries to jointly build our infrastructure with far less money, and build our competitive capacity in the process.

Implications for School Curricula

This approach of indigenous industrial capacity building will have a significant collateral impact on the educational systems of the developing world, not only by drawing young boys and girls to the appeal of science and technology, stimulated by local role models, but also by the catalytic effect of such efforts in creating support industries, which themselves will also need young talents to drive and manage them.

Expert Human Resource

Where will the developing world get the expert scientists and engineers to support such indigenous industrialisation in ICT? From the existing pool of their expert men and women spread throughout the world in practically all the key ICT industrial and research institutions around the world. For them, such opportunities would be their dreams come true, having the opportunity, finally, to apply their talent and experience to help develop the homestead. There will also be many top-flight scientists from the industrial world who would find the challenge of such a bold initiative very appealing. We at Telecom Africa know this to be true.

Human Resource Survey

In this regard, a major problem is that most developing countries do not have any idea about how many of their citizens are in the field around the world, and how good they are. They will have to conduct appropriate human resource surveys to quantify and qualify their existing capacity.

Such expertise as is abroad need not uproot itself and head home. One enabling asset of the digital age with its global networks is the capacity to deliver expertise electronically clear across the world without taking a step. A digital initiative must make the best use of digital facilities.

Partnerships

Given the enormity of the challenge of the digital divide and its resulting opportunities, there is scope for all sorts of profitable partnerships.

South –South Partnership

To facilitate the development of indigenous industrial capacity in ICT, countries and regions of the developing world can and should explore prospects of collaboration between their private sectors, universities and research institutions. The similarity of environment and needs should provide a firm basis for synergy and correlation in research and development to find common or similar solutions.

Global Partnerships

Prospects for collaboration with corporate institutions in the industrial world (which are smart enough to recognize both the inevitability of people to seek to build their own competitive capacity) and the advantage of early partnership on equitable terms with a commitment to mutual access to each other's primary markets, should not be overlooked.

Similarly, partnerships between budding indigenous ICT universities and research and development institutions in the developing world, with leading institutions of research and development in the industrial world hold good promise of collaboration to bridge the digital divide, with benefits accruing to all sides. In this regard, efforts at MIT Media Laboratory, especially the Digital Nations Initiative undertaken in collaboration with the Centre for International Development at Harvard University and involving many nations, and the "Unwiring the World" Initiative (undertaken in collaboration with Costa Rica) are significant steps in this direction. One of the projects of the Digital Nations, Sustainable Access in rural India (SARI), undertaken in collaboration with the IIT-Madras and the I-Gyan Foundation, is inventing innovative and inexpensive technologies for connecting rural communities.

Producing for Export Markets

Far fetched as it might seem, everyone wants to pay less for the same quality of goods and services. While building capacity to produce indigenous demands, the prospects for ultimate export into the markets of the industrial world should not be dismissed. With competitive quality, the admittedly high fences of resistance the importation of engineered products and services from the developing world brings, will be breached with time, both by mavericks who fancy the idea and by industrial behemoths whose cash flow pressures might compel them into succumbing to economic common sense at some point.

Software

All the above applies not only to hardware but also software and applications. The latter needs little elaboration, as the acclaim of the achievements of India in this regard is common knowledge today. The strategic and political (if not moral) challenge to the emerging industries of the developing world is whether or not they will seek profit by collaboration with their colleagues, or opt instead to become the new ICT bullies in the neighbourhood.

Heritage Technologies versus Technologies of Tomorrow

Obsolescence is a major risk in technology. Those who have little from the past are in a better position to dump it all and build afresh with the technologies of today and tomorrow. The infrastructures of the developing world, the bridge to the digital divide, must be based on cutting edge and upgradeable technologies as a hedge against obsolescence. This is important because where there is little capital to play with, there will be even less to use to replace obsolete equipment.

Bridging the Human Resource Divide

A range of strategic steps must be taken to address the human resource needs of the developing world in its effort to bridge the digital divide. In addition to drawing on existing expertise, the curricula of academic institutions, from primary schools to universities, must be restructured to include the teaching of ICT science and technology, including research skills. However, this must be done without sacrificing the commitment to the teaching of the arts, humanities and social sciences, as the gains in ICT science and technology must be within the overriding objective of creating enlightenment and culture as the ultimate goal of education and social, and even economic, development.

Access to Global Centers of IT Learning

It is also important, for both the industrial as well as the developing world, that access to the same institutions of ICT higher learning and research should be promoted. There should be a concerted effort to provide admission and scholarships to young men and women from the developing world to attend such leading institutions as a way of training the scientists and specialists of tomorrow. The compelling argument that this is in the best interest of the industrial world need not be made, in light of the large numbers of specialists from the developing world who currently provide cutting edge expertise to the leading industrial and research institutions of the industrial world today.

Parenthetically, since we are hosted by WIPO, it might be interesting for WIPO to provide a rough estimate of how many patents in ICT are held by people from the developing world; that is, if they can identify those held by the institutions they belong to

but for which they are credited for the innovations. This would help serve as an incentive to others.

The Cultural Divide

The asymmetry of content in the products of the digital industry, while depriving the developing world of the opportunity to develop and market products from their culture and experience to the world market, also sorely deprives most of the industrial world of the wealth and versatility of the culture of the vast majority of the world. This doubly regrettable situation can be resolved by deliberate promotion of a global market for a more diverse range of content and products from around the world. Such a move, besides enriching the culture of the industrial world at a time of temporary saturation, would be a source of expanding the market in digital content products, to the benefit of all parties.

A collateral result of such a bold undertaking will be the improvement in world understanding through better knowledge of each other and the diversity of global ideas and culture. This, in turn, will enhance global goodwill and help reduce ignorance and suspicion, two embers that often stoke the flame of conflict. This process is what I call "*from Digital Divide to Digital Diversity*".

The Limitations of Technology

Technology, even our very own information and communications technology, has its limits and limitations. The pre-eminent asset and resource for continuously pushing back the horizon of our knowledge and capacity, and enhancing the quality of our lives remains our human heart and intellect, and the context and enabling environment within which we exercise both; namely, our society, culture and civilization.

The challenge of bridging the digital divide is not only a scientific and engineering and economic one, but also an overall challenge to society. They are material and intangible collateral challenges of cultural, social, psychological, even philosophical, and definitely religious nature. To unleash the courage needed to rise to the challenge of bridging this divide primarily through indigenous efforts; that is, the challenge of self-development, will require the genius of all. This is also important to prevent the trauma, which can arise from a haphazard attempt at such quantum leap, without full and comprehensive strategic planning and monitoring.

Because we are all vulnerable to negative fallouts from the downside of the electronic culture of the globally networked environment, we must participate, indeed insist on participating, in defining, directing, managing and masterminding the dynamics of our connected world. There must be a democratic global quorum to manage a truly global digital world. A few critical mistakes have already been made by others while the developing world has been otherwise pre-occupied, for which we inevitably will share the burden and consequences. Perhaps with the advantage of having been long-standing onlookers, we can help reconfigure the nature of our digital world for the benefit of all of us.

The Cocooned Mind

For example, what began as a fascination with computing, and later the joy and relief of the facilitation the combination of computing and telecommunications offered to substantially expand our ability to accomplish tasks and transactions at exponential levels of scope, volume and speed, may inadvertently have led, in some small way, to a sharp reduction in the level to which we exercise or feel the compulsion to exercise our minds in responding to especially the complex challenges of our daily life and existence. This has exposed our minds to the potential danger of a creeping atrophy.

This freedom not to have to think or reflect, this concession of our intellectual pre-eminence to electronic hardware and its enabling software, this substitution of electronic *laissez faire* for intellectual *engagement*, aided and abetted by the constant deluge of confounding data and information, may already have led to the encrustation of our reflective capacity in a cocoon of delusionary and debilitating intellectual somnambulation.

This process of the encrustation of the mind by a wholesale relinguishing of the responsibility to think for mankind to the machines we created merely to reduce the tedium of repetitive or muscular chores, has created a phenomenon which I would like to call "*The Cocooned Mind*". We might also call it "The Captured Mind" or "The Structured Mind", to offer a choice to suit a broader spectrum of ideology!

For all practical purposes, and even taking into account advances in intelligent computing, computing basically deals with the realm of tangibles, issues which respond to logic. Unfortunately, most critical challenges of life exist in the more complex realm of intangibles. From all we know to date, the human mind is the only asset created to, and capable of mastering and managing intangibles, to the extent that this is at all possible. If we allow our minds, therefore, to succumb to the threat of electronic intelligence substituting itself for our reflective capacity, we expose ourselves and all humanity to grievous dangers of the inadvertent neglect of critical challenges which constitute the core of the challenge of our lives. Recent events which have traumatized all of us would seem to suggest more than reasonable efficacy in this thesis. Those of us from the developing world who have not had the opportunity, or have not been able to afford to make this mistake, have a responsibility to assist the global community to pull back from the brink.

Electronic Intelligence versus Human Intelligence

In building the capacity to bridge the digital divide, we must not limit our sights merely to playing catch up, but to improve on what exists. The advantage of being a latecomer to a technology environment (you might even call it the consolation prize) is that we can learn important lessons from the pioneering experiences of the industrial world. With the advantage of hindsight, we can tailor our ICT strategies and capacity building to be an improvement on what currently exists at the cutting edge. Such an approach applies not only to technology and economics, but also to the policy, cultural, social, psychological

and other human aspects of innovation and development. We must do so with a view to enhancing our humanity while restricting the often-intangible threats of the excessive and unmitigated embrace of technology to human society. Specifically, we must distinguish between human intelligence, replete with its sensitivity to nuances and complexities, and electronic intelligence, placing human intelligence above all. Electronic intelligence should be a tool, only a tool, in aid of human intelligence, and must not supercede or replace it.

The Threats and Pitfalls of Electronic Culture

There are tangible and intangible threats and pitfalls in the uncritical embrace and duplication of ICT, which the developing world must take cognizance of and seek to master even as it seeks desperately to bridge the digital divide. Social complications have evolved in the industrial world, the antisocial psychological impact being one of them. The bloated evaluation of information and its attendant devaluation of reason and judgment is another.

E-Warfare

Another threat that is worth highlighting is what I call "e-warfare". Electronic warfare or e-warfare is the ability, through the facilitations of IT technologies, especially the global networks, of anyone, even a child, to successfully wage an electronic war against all the global powers combined and more, with devastating consequences. Besides the threat to security, the damage to corporate databases and operations, and the humongous cost of pre-emptive and rescue efforts, which is simply a way to wage global wars for less than pennies, it also poses threats to human lives as they affect the data with which hospitals and other institutions manage and deliver health care, and how our overall security, transportation (especially air transport) and otherwise routine operations are managed. A few statistics are daunting:

According to *Computer Economics*, the cost of virus attacks totaled $17.1 billion US in 2000, more than sufficient to bridge the global digital divide, or for that matter, to feed a good number of the world's poor. It was estimated at $12.1 billion US in 1999, and is, so far this year, $10.7 billion US. The cost of defending against the Code Red worm, which appears to have perfected a programmed scheduled assault, was $2.6 billion US in July and August 2001 alone.[4]

Telecom Africa: Taking the First Steps on a Long March to
Digital Equity and Competitive Equality

 The right to advocate innovative self-development in ICT capacity for the developing world carries with it the implicit responsibility to demonstrate such initiative in accordance with the old adage of aligning one's limb with one's utterances. At the Telecom Africa Corporation, we have acted to jumpstart several of these processes.

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[4] According to Michael Erbschloe, Vice President of Research at *Computer Economics*, as quoted by Reuters News Service, 3 September, 2001.

In the area of industrialisation through indigenous manufacturing, Telecom Africa is engaged in a Joint Venture, amongst others, with the FiberHome Telecommunications Technologies Ltd (a division of the Wuhan Research Institute, China's leading research and manufacturing company in optical fibre equipment and cables) to manufacture equipment and cable in Africa, complete with facilities for research and development. We expect that this initiative, which will be built on the talent of African scientists and engineers working alongside their Chinese counterpart, will enable any African country to build its ICT infrastructure for no more than fifty percent (50%) of current prices. We expect to build our first facilities in Namibia next year, to serve the SADC region, and will follow with facilities in West Africa at an appropriate location to be decided upon in due course. Besides providing the full range of optical fibre equipment and cables for Africa, we expect to export some of our products to other markets.

In the area of quantifying the existing ICT Human Resource expertise as a strategic tool for industrialisation and indigenous globally competitive ICT development, Telecom Africa is conducting a Global Human Resource Survey of African ICT Male and Female Expertise. This will not only help African governments and policy makers have a solid basis of existing capacity, but will assist us at Telecom Africa and other industry institutions to identify and access such cutting edge capacity to form the core of our scientific and engineering teams.

In the area of research and development, Telecom Africa is, amongst other initiatives, working with UNESCO to build the Telecom Africa Virtual Research Laboratory to drive the preliminary stages of its research efforts. This VRL, which will be a secure global Virtual Private Network (VPN), will link African and other interested ICT scientists and experts around the world to address technological challenges as the first step to finding solutions. This VRL will turn what has always been disparagingly referred to as a "brain drain" into a "global brain pool" without compelling many African experts to relocate to Africa in order to contribute their knowledge and expertise to nation-building.

Telecom Africa is also exploring collaboration in research and development with other research institutions in both the industrial and the developing world. We have also commenced an initiative to promote cross-border cooperation in Africa to facilitate the building of affordable infrastructure, especially for rural and universal access.

As an example of south-south cooperation, Telecom Africa is working in close partnership with the United MultiMedia Company of Malaysia, in the area of content development and e-learning, to provide services not only for Africa and Asia, but also for the industrial world. Telecom Africa is preparing to undertake to conduct a comprehensive technology review and aging analysis of existing and emerging ICT technologies as a strategic tool to hedge against the investment of limited financial resources in technological obsolescence.

At the high end of electronic security and certification, Telecom Africa is in partnership with the Geneva-based E-Security Consortium, WiSekey, for the deployment of

electronic certification to enhance a whole range of applications in Africa and elsewhere, including e-voting, e-banking, e-health and more.

From Digital Divide to Digital Diversity: A Larger Vision for a Bigger World

The call for the courage at self-development to bridge the digital divide does not exclude a significant role for the industrial world, or excuse it from any obligations. Increasingly, we come to see that a fundamental feature of our so-called global village is the fact, perhaps uncomfortable for many, that what is good for others most likely is good for us, and what is bad for others, if left unmitigated, could one day turn out to be bad for us. In this regard, there is also the challenge of good faith and good will on the part of the major industrial companies, which presently dominate the global IT industry. Without doing their strategic thinking for them, I would suggest that it is worth their while to consider in counterpoint, the duality of trade opportunities with a robust, innovative, truly networked developing world, an IT-savvy developing world, backed by cutting edge indigenous scientific and industrial capacity, or with a helpless, seemingly hopeless developing world totally dependent on the discretion of the industrial giants and increasing unable to pay the excessive charges for the relatively low-level technology sold to them. Setting aside all moral and ethical issues, the bottom line is that it is eminently more productive, more profitable and more gratifying to conduct business amongst equals or at least among near-equals, with so dominant an asymmetrical trade in which one side is the seller always, the other side the buyer always, and where the interests of the twain never meets.

If my friends in the industrial world need an example of best practices to persuade them of the wisdom of this position, they need only look at the role the U.S. played in re-building Europe after the devastation of the Second World War. If the United States had sat back and basked in the misguided glory of a devastated Europe, which would be beholding to her for the conceivable future, it would never have had the benefits of a strong trading partner and political ally it has in Europe today, by having helped to rebuild her.

For us in the developing world, our choices are quite simple---we must rise to the exciting challenge of ICT self-development to champion the search for solutions to our digital needs, and create very valuable intellectual property in the process, or quite frankly, drop dead, which is not an advice or command, but a figure of speech! We must find the courage and wherewithal to overcome the self-handicapping, the result of the relentless deluge of the badgering of our psyche by untested presumptions of the deficient expert capacity of the developing world by a media to which we have no input, and the resulting humiliation of our premature condemnation to global irrelevance other than as uncritical and helpless consumers.

We must also find the courage to determine and define what we truly believe we need and want, rather than imitate what is or has gone before us, prodded by the glitter and the asymmetrical proclamations of achievement and satisfaction in places where we have no

means of verification. No serious people can hitch their aspirations to the expectations of other people. In seeking to bridge the digital divide, we must also find, in the first place, the wherewithal to bridge the divide of biased expectations.

I have always said that there comes a time in the lives of a people, when no matter how embattled, they must find the courage to take their destiny in their own hands, and armed with their own resources, including knowledge and the passion to excel, strike out to shape their future, with the help of friends if possible, alone if inevitable. That time is now, and thanks to the heightened value of knowledge and intellect and the facilities of the digital revolution, we can draw on the existing capacity of all our men and women around the world, and of all our well-wishers, to bridge that digital divide, creating new and exciting innovations, and enjoying the entire process in a new Renaissance.

At Telecom Africa, we have made that choice. Our radar is fully distended, and is one-dimensional in the signals it can pick up—success. Failure is not an option.

I thank you.

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