Turning the Cellphone into an Antipoverty Vaccine

Diju Raha
Eximsoft International, Raleigh, NC, USA
Diju.Raha@Eximsoftint.com

Sorin Cohn-Sfetcu
OrbitIQ Inc, Ottawa, ON, Canada
SCohn@rogers.com

Abstract — **Information and communications technologies have yet to impact more than 4 billion poor and illiterate people who are still deprived of the basic means of economic, social and health betterment. The potential role of cellphone based services as an effective tool of economic emancipation and social improvement is highlighted in this paper. The time has come to harness the adoption of cell phone by the poor in a top-down systemic way. This will require rollout of cellphone based "citizen services platform" to enable the masses of poor people to reach unprecedented levels of achievement through "just-in-time" information-&-decision-&-action on the economic, social, education, health and, yes, political fronts, thus achieving a *Connected Opportunities (Mobile) Revolution* similar to what has been done with the *Green Revolution* in the 50's.**

To achieve such goals, it will be necessary to develop new classes of service and employ different modalities for user-service interaction. It will be necessary to use inexpensive and readily available services to overcome illiteracy and avoiding the expensively complex web-based type approaches. Naturally, the services will have to offer several classes of user interfaces, in order to satisfy different types of users (and devices) and allow for evolution in step with the dynamic evolution of population.

Index Terms — **Mobile revolution, Cellphone services, Services platform, Services for the poor, Just-in-time services, C-services, Iconic service interfaces, Empowering the poor, Social transformation**

I. Introduction

Information and communications technologies (ICT) enable our modern way of life – from economic achievements and individual prosperity to global entertainment. Information technology plus communications plus transport have been the harbingers of globalization and the "death of the distance to success". But not so far for the more than 4billion poor and illiterate people – mostly in Africa, Asia and South America – who are still deprived of the basic means of economic, social and health betterment.

Here is where the cellphone services will play a determinant role – that of effective ***vaccine against poverty***. Indeed, the cellphone has already evolved – haphazardly – as a tool of economic emancipation and social improvement as highlighted in this paper. It has been already accepted faster and in greater numbers than any other modern invention by populations worldwide, by the elite and the illiterate alike despite the underlying technology complexities. The cell-phone has become the location independent catalyst for "*just-in-time"* services – be they teenager chit-chat gratification, serious discussions, health emergencies, simply entertainment or even real business transactions.

Cellphone based services are becoming indispensable "*sine qua non"* instruments embraced by the poor and illiterate as the means to improve their economic well being, social status and healthy survival. There are numerous examples all over the poor parts of the world where local entrepreneurship, enlightened leadership or market forces have led to interesting ground-breaking cellphone applications and progress for the some of the poor who were given the opportunity to participate.

Still, there are more than 4 billion poor people in the world deprived of real means and opportunities to better themselves and the lives of their children. This is not due to lack of generous aid from rich developed countries, but because of the failures of traditional ways in which such aid – in excess of 2.5 trillion dollars over fifty years – has been directed and distributed in projects that did not address the fundamental mechanisms of poverty and illiteracy: the lack of true opportunities for self-sustained improvement.

Just as a vaccine stimulates an immune response to prevent infection or create resistance to infection, thereby improving overall quality of life, the cellular phone can stimulate opportunities for economic growth to aid in preventing poverty. The cellular phone, if used prudently, can be an effective "vaccine" to enhance the overall economic and social quality of life in developing nations.

While various industrial forces and enlightened local leaders are undertaking worthwhile and profitable paths to further adoption of the cellphone by the poor of this world, it will require the concerted action of industry, governments world bodies, civil societies and aid agencies to achieve a faster and more effective deployment of the cellphone as a vaccine against poverty. This may requires such non-industrial institutions to rethink their aid strategies and proactively cooperate with industry to invest in cellphone based "***citizen services***" platforms to deliver and facilitate economic and social

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services directly to the illiterate masses for their self betterment.

The directed application of cellphone services on a massive scale to enable the connected opportunities for self-betterment in poor areas of the world is akin to the ***Green Revolution*** which began in 1945 in Mexico and spread quickly globally as the concerted movement to transform agriculture by developing more varieties of nutritious plants and better techniques for feeding the rapidly growing population of the world. After an initial start in Mexico, the Green Revolution benefited from the initial support of the Rockefeller Foundation, the Ford Foundations and other major agencies to proceed with extensive agricultural research and infrastructure development with major social and ecological impacts and the undeniable result that food production kept pace with worldwide population growth. The Gates foundation is also a supporter of the Green Revolution, as well as some of the major campaigns to vaccinate people against malaria, HIV, etc. Likewise, we are now in a position to proceed with the ***Mobile Revolution*** for the 4 billion unserved**,** by developing the infrastructure, the devices and the specific civil cellphone services necessary to empower the poor for economic and social self-betterment.

Properly planned and effectively executed programs to jump-start the services and invest in a few billion minutes of cellphone air time for the poor will end-up doing more for the poor than the billions of dollars in ineffectual aid passed through corrupt and insensitive channels. In its turn, such an investment initiative will supercharge the industry to accelerate the technology cost reduction and the development of massive service platforms which will have further beneficial impacts on the avalanche adoption of cellphone based social and economic improvement services for the poor. How this can be done and what is necessary to be implemented is outlined in this paper.

II. The Cellphone Evolution

It has taken about 25 years for the cellphone and its related services to evolve from status toy for the rich to become the everyday companion for the middle classes. Hopefully it should take less than 10 years to become the indispensable tool for the poor and disenfranchised masses world over.

A. From status toy for the rich…

Indeed, it took about 30 years and the most devastating global war conflagration for the transition from the first radio telephone on German first-class trains in 1926 to the first fully automatic mobile phone system commercially released in Sweden in 1956. The Swedish system grew to 600 customers by 1983 and the mobile phones decreased in size from40 Kg in 1956 to "only" 9 Kg in 1965.

It took the invention of cellular systems by Bell Labs of USA in 1947 to move the technology to the next platform of adoptability by enabling higher magnitudes of service through the re-use of sectors of radio frequencies in hexagonal cells covering a large territory. It was necessary for another Bell Labs invention in 1970 – the automatic hand-off - to allow mobile phones to maintain a conversation while crossing from one radio cell to another. One of the first public commercial mobile phone networks was the ARP network in Finland (1971), but the real beginning of cellular services came with the AT&T Chicago trial in 1978 and the NTT Tokyo cellular service in 1979. Cellular services were also introduced in Scandinavia by 1981, with the advantage of international use of mobile phones. The first truly hand-held portable came from Motorola only by 1983 and it took a few good years for cellular phones to migrate from automobile-centric usage to personal device usage.

B. To everyday companion for the middle classes…

By 1998 there were around 1 billion cellular phones world-wide – a record in terms of speed of new technology adoption. The second billion phones were sold in only 4 years, and the third took just 2 years, while the industry has gone through 3 generations of cellular technologies. By the year 2000 almost 40% of the world's population lived within range of a cellular network, whereas today this number is close to 80% and continues to increase daily.

One fundamental reason for the rapid increase in cellular networks is that they are much less expensive to build and maintain than traditional fixed-line networks. Another major cellular advantage is that cellular service is no longer tied to a fixed address, nor is it tied to requirements for monthly bill payments (thanks to the pre-paid card innovation), nor does it require literacy like personal computers.

Equally significant, the cellphone (and its associated services) have quickly evolved from being a voice-centric device to also being a text and iconic communication device - thanks to Short Message Service (SMS) - and now becoming a full-fledged multi-media device thanks to 3rd generation technology and the Multi-Media Services (MMS).

Even more, cellphones have started to accumulate a multitude of other functionalities and services – from taking pictures to video cameras, from calculators to address books and calendar machines, from translation machines to full multi-media entertainment devices, from personal identifiers to geographic positioning system (GPS) localization devices, from small game machines to amazing World-Wide-Web & internet capabilities – all in one personal, battery driven pocket device.

C. To indispensable tool for the poor

We are now on the cusp of the era when the cellphone is becoming an indispensable tool for the poor. The networks are looking forward to the 4th generation of digital cellular technologies and the cellphones themselves are starting to become truly affordable and usable even at the level of poverty typical for the last 4 billion people on earth.

The next section will present several examples of such utilization engendered by some market forces, the enlightened activities of some pioneers as well as some

grass-roots entrepreneurial spirit. But such forces are not enough alone to break the barriers of poverty, illiteracy and governance failures. To advance beyond the present situation and speed-up the adoption of cellphone services by the remaining 4 billion people, it will be necessary to engender the proactive collaboration of governments and social organizations with the appropriate service providers and manufacturers of network infrastructure and cellphone devices.

III. Economic, Social and Political Impact of Cellphones

Why has the cellphone been embraced by so many people around the world, why has this happened many times faster than for any other form of communications or advanced technology? Why not the traditional telephone, why not the powerful personal computer? Why not the calculator or the radio or even the TV? The answer is multi-faceted of course, but by and large the cellphone won because it brought location independent ***"just-in-time"*** services, and opened the way to new opportunities of life and economic fulfillment, because it started as basic voice-centric means of enlarging the field of personal betterment irrespective of time and location, because it did not require a fixed address and the apriori capability of paying a monthly subscription fee.

A. Stories of entrepreneurial success

In her article in The New York Times of April 13, Sara Corbett asked "*Can the Cellphone Help Global Poverty?"* and then she proceeded to give numerous examples of how the judicious application of cellphones helped people in disparate localities around the world.

There is the famous case of the Grameen Bank, started Nobel laureate Muhammad Yunus in Bangladesh, who pioneered the concept of micro-financing and went on to develop Grameen Phone Ltd. which provided more than 250,000 poor women in Bangladesh with a cellular phone as a micro-business tool: village phone service providers – there where there were no other affordable means of communications.. The cellphones were armed with long-lasting batteries and the women were offered micro-credit to buy air-time and make a living selling services to their neighbors. The crucial fact about Grameen Phone is that it became highly profitable and is now one of the largest telecom service companies in the country.

In Nepal, people used mobile phones to enhance the effectiveness of sales agents for poor farmers, while in Uganda people preferred to change priorities away from housing, water, electricity, and sanitation towards cellphone services because they saw them as opening opportunities for long-term economic growth. No other investment in a poor family's budget offers greater potential for fast and durable change as the cellphone – largely because it improves the access to jobs and market opportunities.

In Kerala on the Indian South Coast, fishermen used cellphones to prospect buyers for their catch thus showing a relative economic improvement of between 10% and 50%.

Most interesting was the study done by the London School of Business, which concluded that the economic impact of the cellphone could be measured as an increase of national GDP. Their numbers showed a GDP rise of 0.5% for every 10% in mobile phone penetration. More importantly, the cellphone effects of the GDP rise are more evenly spread among the various economic strata of the country.

Equally important, the cellphone has provided a significant increase in security and health care, as people could use cellphones – voice or text messaging (SMS) – to get information about where and when they can get medical help - without having to go miles on foot only to find that the health worker was not there. In Africa people are using cellphones to avail of education and help even on cultural taboo topics like AIDS and STDs thanks to the no-charge anonymity of SMS services.

The personal security and economic survival impacts of cellphones are even greater in moments of disasters which affect especially the poor and the migrant populations otherwise bereft of any forms of communications. With the help of cellphones, they can ask for timely and properly localized help, and authorities can inform the population of impending disasters and the measures taken to help survivors.

B. Stories of market forces and achievements

Naturally, enlightened communication service providers and wireless manufacturers have seen the economic and social impacts of the cellphone and have pushed forward with interesting solutions to take advantage of the opportunities. While in parts of Africa people have started to use prepaid airtime as barter in transferring money across borders and distances (for a commission, of course), in South Africa and the Philippines some companies proceeded formally to create services that allow customers to use their cellphones for purchasing credit from the service provider via locally accredited kiosks and the post offices, storing the credit and then transferring it to another phone or using it in commercial transaction. The World Resources Institute concluded that such forms of mobile banking will bring into the formal economy the immense numbers of presently disenfranchised people.

Vodaphone in Kenya has seen the immense potential of mobile banking and initiated the M-Pesa service, which has wildly exceeded expectations and is now slated for similar growth in other parts of Africa and South Asia.

Cellular manufacturers as well, have seen the huge potential numbers of potential new users and have started to apply seriously their technologies towards enabling them to adopt the cellphone. Both Nokia and Motorola, as well as the Asian manufacturers are spending efforts in developing low cost cellphones and are experimenting with devices specialized for the particular situations in the poor areas of the world. Especially troublesome is the lack of electrical power which impedes both the deployment of network infrastructure as well as the usage of the cellphone itself. So, some wireless manufacturers are looking at using wind or solar power to make radio

basestations work, while cellphones could be recharged from solar cells or by hand dynamos using human energy.

The rapid growth of cellphone penetration in China, India and Africa is a testament to how the poor and illiterate masses are embracing the cellphone – not for idle communications but for economic and social improvement in their lives. For many of the world's poor the cellphone with its unique mobile number has become the de-facto identifier – especially for the hundreds of millions with no fixed postal address.

But change on a large scale for the half of humanity in the poverty slums will not happen fast enough unless there is a shift in service offering paradigms and the governance of aid from the rich. The old ways of structuring and delivering aid to the poor have not proved effective enough and now is the time to rethink how best to marry advanced technology with the industrial market forces and the forces of governments and pan-national agencies in order to address the issues of economic and health growth in the 3rd world.

IV. Governance Failure

$2.5 trillion financial aid over the past 50 years has failed to provide the solution to the problems besetting the underdeveloped or developing countries. The fundamental principle that has governed such aid has been that of local government dedication to using aid for correcting market failures – largely to build the necessary infrastructures (dams, roads, bridges, schools, etc), initiating mass campaigns for worthy services (education, health, etc) and subsidizing vital goods (food, medicine, petrol, etc).

Sometimes, such aid has actually worsened the situation due to governance failures like unsound economic policies, reliance on bureaucratic solutions, corruption and lack of rule of law, insufficient emphasis on education and entrepreneurial grass-roots solutions. Due to inefficiencies in traditional aid structures and governance practices there are still more than 4 billion people in dire poverty. There is a wide spectrum of governance failure causes:

- Economic and governance policies serving vested interests,
- Corruption in public expenditures,
- Elite distortion of legislation and law application,
- Obstacles to private initiative development,
- Paucity of public services,
- Impaired access to public services,
- Prevalence of bribery as tax on small businesses and the poor.

After trillions of dollars in aid, there is little evidence of fundamental changes in the ways the poor can better their situation themselves in many parts of the world. At the dawn of the 21st century a resolution was adopted by the United Nation General Assembly with specific goals of poverty reduction, increase access to education, clean drinking water, infant mortality reduction and several others - all known as the Millennium Declaration. Some eight years later, many countries have made progress towards achieving the Millennium Development Goals, but most lag behind. The unfortunate, as well as tragic, $1-a-day remains the barometer in measuring poverty. There are around 70 countries in the world, for which the situation may change only by fundamental re-structuring of their social infrastructure or by short-circuiting the system (see *Chaudhury, Nazmul, Jeffrey S. Hammer, Michael Kremer, Karthik Muralidharan, and F. Halsey Rogers. 2006. "Missing in Action: Teacher and Health Worker Absence in Developing Countries." Journal of Economic Perspectives 20(1): 91-116*).

India is a dramatic example - not so much because it has so many poor people but because it has so many resources which have been and may still be wasted due to past governance failures. India is a paradox:

- It is a nation of 1.1 billion people of which there are 200 million women illiterate and over 2/3 of government school children (more than 70 million) can't solve simple numeric problems or read a simple text, yet India has a chronic shortage of skilled labor ;
- India has a huge and well educated Civil Service – greater than the entire population of Sweden; yet India has failed in implementing well articulated and well funded government policies;
- India is a nuclear power, yet 125,000 villages have no electricity;
- India has world class expertise in Information Technologies and has developed the 4th fastest computer in the world (by Tata Consultancy Services), yet India lags significantly in the availability and distribution of basic services to its vast masses.

However India cellular phone ownership is slated to grow to 450 million users by 2010; and herein lies the opportunity to harness the 450 million plus cellphones using massively scalable services platform to deliver and facilitate economic and social services to the masses irrespective of caste, place of habitation or level of education through effective location independent "just in time" services. Such services when developed can be made available globally.

V. Cellphone as a Vaccine against poverty – What Needs to Be Done

The previous sections have shown the potential cellphone impact on the economic, social and health situation of impoverished people in various parts of Africa and Asia even where initiatives were isolated and driven by market forces or locally enlightened authorities. For poverty and misery to be minimized for the remaining 4 billion people without cellphones it will be necessary to apply some strong "medicine" and apply it in a comprehensive and sustaining manner. We are postulating now – based on evidence highlighted here – that the cellphone, and its associated services, can be considered as an effective anti-poverty vaccine. Unlike subsidy aid, which barely alleviates the symptoms, the vaccine acts on the fundamental causes for the malady:

the lack of economic opportunity, the inability to utilize the human resources to the utmost of their potential. Like a vaccine, the cellphone helps the human body to empower itself with the means to fight sickness before it takes over – in this case economic sickness, social malaise and political disenfranchisement. The cellphone as an anti-poverty vaccine will enable the masses of poor people to reach unprecedented levels of achievement through location independent "just-in-time" **information-&-decision-&-action** on the economic, social, education, health and, yes, political fronts..

Of course, this will require the constructive cooperation of market and government forces towards the development of the necessary technology platforms, the cost-effective products and the properly designed services tuned for the needs of the poor and illiterate. Market forces could do it by themselves – eventually, but "eventually" will take too long unless governments and NGOs and pan-national organizations take an active participatory role – to ensure the financing and the orderly application of "the cellphone as anti-poverty vaccine".

To serve the huge mass of poverty-stricken users – 4 billion and counting – it is necessary to innovate with services that can be easily understood, have meaningful value for the large mass of poor users, are not expensive and can be effectively used even by people with less education (or even illiterate).

To achieve such goals, it will be necessary to develop new classes of service and employ deferent modalities for user-service interaction. For example, it will be necessary to use inexpensive and readily available services like SMS, taking advantage of pictorial question-answer paradigms and avoiding the expensively complex web-based type approaches. Naturally, the services will have to offer several classes of user interfaces, in order to satisfy different types of users (and devices) and allow for evolution in step with the dynamic evolution of population.

All in all, implementation of such diversely dynamic service portfolio will necessitate the development of massively scalable service platforms with tremendous computing powers and means for rapid development and deployment of new service features, customer devices and subtending business models. India, with its well trained and disciplined government forces and its world class IT expertise together with super computer know-how, is well positioned to take a leadership role in the development and deployment of cellphone based citizen service platforms. The same is true of China and some of the more developed South American countries.

A. The c-Services©

Any attempt at simply adopting services developed for the developed markets of North America, Japan or Europe would be foolhardy. It is imperative to adapt the services to the specific ways of life and the diverse cultural and social characteristics of each country or even its distinctive regions. We should leave each distinctive region/country to initiate and manage the services that truly satisfy its needs and characteristics. But some examples would be of value here to illustrate the nature of such services and to start the process of defining them. Here are just a few ideas that will probably make it to the market in the next few years – one way or another:

*"**c-Work-Mart**"© Service*

This is the service by which people (professionals, skilled workers, daily laborers, domestic staff, as well as managers and employers) will make available their needs for work and their requests for work in order to find the best and most readily available match. Given the status of India with its highly developed cities and immensely sprawling and diverse rural areas, such a service will need to be tailored for both local (village, city district) markets as well as regional and national ones.

Here is an example of how such a service would work:

- The "*Worker*": If you are willing to work, you sign up for the service with your skills and focus, the region of your availability, the hours and dates, as well as your asking payment rate. The system advises you of the available jobs appropriate to your qualifications and initiates a negotiation session (machine- or person-driven). Optionally, the system may advise you on the appropriate "competitive" situation; e.g. how many similar people are in your area, the payment rates previously negotiated, options for retraining, etc. As well, the employers (businesses or particular individuals) would be rated on various criteria like fairness of pay, safety, cleanliness, etc…
- The "*Employer*": If you are looking for help – let's say for a bricklayer, ca carpenter or someone to man the cash register or help wash dishes - you just send the request and within minutes, you have a list of people available. The list shows what each person is qualified for, how others have rated their work and exactly how far away they are. Typically you will receive a list of half a dozen or more people within a few minutes, each with the declared characteristics and pay rates, but also with references from previous employers. On that basis, one can start an immediate negotiation session.

The negotiation sessions can be machine or person-driven. They may be handled in real time, or could take place in advance. They can be enhanced by the availability of localization information – cellular or GPS based.

***"c-Medical"©** Services*

These are the services providing access to health information and efficient availability of medical help depending on present location, time and emergency of the situation. This is very critical especially for the poor who live in regions where the nearest health worker is miles away, maybe at his home, maybe helping the sick in another village, and there is no way to know where he/she is or how to arrange for a patient visit.

With such services, the right medicines would be commandeered and made available on request at short

notice rather than linger and get past due date in city warehouses. ***c-Medical*** services would cost less and do more to improve the health and safety of poor people than parachuting medicine indiscriminately or building already under-serviced facilities where local elites dictate.

Moreover, the funding institutions (be they Governments or aid agencies) would be able to monitor the quality of service enabled by their investments and take measures for improvement where necessary. Today, health worker absenteeism in developing countries is rampant Such issues of absenteeism and abandonment of duty would not happen in the presence of ***c-Medical*** services available to the population at large.

"c-Wallet"© *Services*

The cellphone has already been adopted as a unique identification tool even for people of no fixed address and capacity to engage in traditional banking transactions. The ***c-Wallet*** services would build on this and empower people to enter and participate in the formal economy. Eventually, the cellphone could become the ***de-facto credit or debit card*** of large portions of the population.

"c-Shopping"© *Services*

The cellphone is ideally suited for receiving and using discount coupons and government rations or direct cash credit thanks to its ability to accept multi-media, to the security of cellular networks and the unique identification of the cellular subscribers. Such services would enhance manifold the efficiency of advertising and coupon (or ration cards or government payments, etc) distribution and free the present cumbersome organizations to do more rewarding and remunerative jobs themselves.

"c-Transport"© *Ticketing*

Likewise, people could use cellphones to get information on transportation latest schedules in real time, make reservations and book ***c-tickets*** thus doing away with the frustrations, the waste of paper and that of human resources typical of present day transportation services.

"c-Government"© *Services*

Governments, as each nation's largest "service" provider should be the one to take most advantage of the new **c-Services** in order to satisfy the entire population in every locality, thus elimination barriers to poverty eradication and doing away with the "babus" bribe practice that inhibits fair progress. Some examples of valuable c-***Government***© services are:

- Loan disbursements to farmers and other rural programs,
- Minimum support for poverty people,
- Old age pensions,
- Ration card distribution,
- Voter IDs.

Many such services could be conceived if there is the political will to start implementing them:

"c-Grievances"© **-** for reporting on administration and business performance on a localized, confidential, secure and unfiltered basis;

"***c-Disaster"©*** **-** for immediate grassroots notification in the event of natural or social disasters, coupled with timely localization of victims and aid workers;

"***c-New Ideas"©*** **-** for opening new opportunities in various walks of life.

These are but a few of the many services that a country with a high degree of poverty needs now. Once a service platform is developed for this kind of services, we shall see a plethora of new services evolving naturally on both a regional as well as a national basis.

Services like these are not yet financially and technically viable on the large scale required. Therefore, it will be necessary for concerted action taken by Governments, civil societies and aid agencies in conjunction with industry forces to jump-start and fund the necessary programs for their effective implementation and deployment. The results – both in terms of quality of life as well as in economic terms for the subscribers and the industrial companies involved – will compensate handsomely the initial financial support.

B. What is required from Industry

The provision of meaningful and cost-effective services to the huge, dispersed and diverse markets characteristic for poverty stricken regions will require a tremendously powerful and innovative "system" consisting of the appropriate Services Platform and an well engineered Cellular Network infrastructure plus, of course, the appropriate affordable cellphones. Such a system will be characterized by some of the following attributes:

- Massive high speed server platform(s)
- High capacity network infrastructure, capable of handling hundreds of millions of subscribers with a variety of voice, data and even video services
- Iconic and/or SMS based services not web based ones
- Localization and user-identification capabilities
- Iron clad network security
- Availability of local (non-grid) power for remote radio base stations – be it wind, solar or other kind of efficient local power system.

The user devices will have to evolve from the present day voice-centric "cellular phones" to information-centric devices that:

- can be used for personal identification (even in case of usage-sharing),
- can exhibit icons for illiterate usage,
- allow efficient service manipulation through easy to understand user interfaces;
- can function with limited power (batteries) or can be powered by easy and cost-effective renewable sources (e.g. hand dynamos, solar cells, etc);
- are sufficiently rugged; and
- are truly affordable.

A market of a few billion virtual users should warrant such devices at an affordable price! Still, for industry to address successfully the development and deployment of the services, networks and affordable user devices it will be necessary to address some fundamental issues, among which we distinguish the following:

- What are the revenue models applicable to the services, the network infrastructure and the devices themselves?
- Who pays for the Services: employers, advertisers, land lords, end-users, etc?
- How will payments be effected? What financial back-ups and guarantees will be offered?
- What is the role of cellular network operators? Will they be simply satisfied with increased air-time usage, or will they want to become fully fledged value-service providers?
- Should all the financial services be provided by government appointed banks?

Indeed, if Governments and Aid Agencies would rethink their priorities and put emphasis on catalyzing self-improvement for the poor, if, for example, they would donate the cellphones available initially loaded with predetermined minutes, the service providers and network operators will find the matching investments to extend the networks and build the necessary service platform to capture the rest of the population as their subscribers.

C. What is needed from Governments, Aid Agencies and NGOs

Governments, Aid Agencies and NGOs need to consider seriously the top-down application of the cellphone revolution to empower people and reduce poverty through self supporting means rather than by failed soul-less subsistence aid.

To do so, it is necessary for governments and pan-national agencies to fully understand the nature of the cellphone and its many application facets as a tool for economic and social betterment. They should consider the cellphone, and its associated services, as the embodiment and the means to achieve "*just-in-time"* services where they are most needed and proceed to treat it as one of the more powerful vaccines against poverty.

On that basis, it will be necessary to re-think and re-prioritize economic programs from those of subsistence type to those of self-emancipator action.

- Governments will have to consider supporting industry to develop low-cost cellphones and service infrastructures that can be handled by the masses even if largely illiterate and bereft of fixed locations with the usual home services – electricity, water, etc.;
- Governments will then have to participate in the creation and deployment of the new raft of ***c-Services*** and low-cost cellphones necessary to jump start the process of "cellphone inoculation" against poverty and social disenfranchisement.

There are two distinct aspects in the application of the cellphone as a vaccine against poverty.

- One concerns the enhancement of the economic well-being, which has been primary in our considerations above;
- The other one covers the uplifting of social conditions and giving all people a direct unfiltered say in what they need and how they are being treated.

The cellphone is the only instrument people could use effectively to obtain critical information on health, economic and social issues, to report their needs for basic amenities in cases of disasters, or simply to complain, at the grass roots level, of the daily issues with government services like the absence of proper primary school teachers or health workers there where they are needed most.

The cellphone has already evolved and been proven as a tool for economic emancipation and social improvement; to achieve its full potential efficiently for the remaining 4 billion people without it will be necessary for industry and governments – local, national and pan-national bodies – to collaborate in applying it as one of the key vaccines against poverty.

Cellphone information from a remote place in sub Sahara Africa or up in the mountains of Asia or down in the vast deltas of the Indian subcontinent could be immediately brought into the plush UN facilities in New York and Geneva, could be displayed on TV stations worldwide and create instantaneous global awareness and galvanize the public opinion to action.

VI. CONCLUSIONS

We have shown how the cellphone, and its associated services, has haphazardly evolved to become an important factor of social and economic life for almost half the global population. It has proven its "adoptability" by the masses despite the underlying technological complexities, thus opening the way for much broader applicability and effectiveness.

The cellphone has become an ubiquitous instrument of identification and service delivery even for population strata that were thought too poor and uneducated and hence impervious to technology and modern methods of self-betterment. The cellphone enables "*just-in-time"* services and enhances human awareness of opportunities on much wider horizons than previously possible. The cellphone empowers the people to entrepreneurship and can become an anchor to safety and economic well being for populations constantly on the move due to low grade economies, disasters and social turmoil.

Bringing the cellphone and its associated services to the next 4 billion poor people in the world is not yet financially and technically viable unless proactive cooperative action is taken by governmental and civil society institutions together with industrial companies – network operators, service providers and telecom manufacturers – to jump-start the technology and service design programs necessary for the application *en masse* of the cellphone as a vaccine against poverty. The operational experience accumulated with the Green revolution of half a century ago should be a guide to the

best ways to proceed with the ***Mobile*** (or, specifically, the ***Connected Opportunity***) ***Revolution***.

The parable of the fisherman's choice between fish for a day or the instruments to fish for life describes perfectly the changes which the cellphone can bring if applied properly as an instrument of change and betterment of the quality of life.

The cellphone has broken many traditional barriers and cultural taboos and it could lead to truly revolutionary changes in the way governments, world bodies and aid agencies perform their duties. But for all of that to happen there is one primal need to fulfill: the political will for change and effective action.

Diju Raha is Chairman and CEO of Eximsoft International in Raleigh, NC, USA. He is Co-founder and President of Connected Opportunities Inc – a not-for-profit organization dedicated to the development and spread of cellular service applications throughout the developing world.

He is a publicly acclaimed leader in global business, having initiated Nortel Networks' major international expansion in knowledge work. He conceived and led Nortel's program to outsource Research & Development to India in 1989, and was instrumental in expanding this capability over the following decade. At Nortel, Mr. Raha served as Vice President for International Research and Development, establishing business operations in India, China, Russia, and Brazil. Mr. Raha was credited with jump-starting the Indian IT technology boom and was called "India's Catalyst" by the *Ottawa Citizen*. Since his retirement from Nortel in 1999 Mr. Raha has been active in Information Technology initiatives, including founding two companies. The first was IPmeeting, a web-based product company. The second, EximSoft International, is a software products and services company specializing in mobile e-commerce; secure smart card infrastructure, and payment systems.

Mr. Raha has been a visiting lecturer at Waterloo University (Ontario, Canada), a United Nations consultant to Brazil's national telecommunications services company (TeleBras), and has held several executive positions with professional societies and charitable organizations. He was the Executive Director of the United Way of Palm Beach County, served with the Florida Chamber of Commerce, and was board member for the Canada India Business Council. Currently Mr. Raha is a guest lecturer at Eller college of management at University of Arizona and frequent speaker at national and international conferences on the globalization of the IT and professional services. Mr. Raha holds a bachelor's in Physical Science from the University of Calcutta and a Bachelor's in Electrical Engineering from the University of Aston in Birmingham, England.

Dr. Sorin Cohn-Sfetcu is President Global Portfolio of OrbitIQ Inc - a global business accelerator with headquarters in Ottawa, Canada. He is also a co-founder and Corporate Secretary of Connected Opportunities Inc. in Raleigh, NC, USA.

He has 35 years of international business & technology experience, having been involved in most facets of "*innovation development*" in its broadest sense. From 2004 to 2007 he was Managing Director EMEA for a California Optical Access Company, following a stint as CTO for Wireless Multimedia Solutions in North Carolina, USA. Prior to 2000, Sorin held senior positions with Nortel Networks in Wireless, Enterprise and Digital Switching divisions. He initiated the Companion© portfolio. Dr. Cohn-Sfetcu was Director for Exploratory Programs at BNR, where he coordinated advanced technology studies in Palo Alto, Ann Arbor, Dallas, Toronto, Ottawa and Montreal. In the 1980's, Dr. Cohn-Sfetcu created the BNR laboratories for Man-Machine Technologies leading to the world's first touch-sensitive display-phone, multimedia social teleconferencing, integrated image-voice systems, and early cellular smartphones.

Dr. Cohn-Sfetcu has several essential patents in web services, wireless and digital signal processing. He has over 60 industry publications and presentations. In parallel, during the 1980's, Dr. Cohn-Sfetcu has been an Adjunct Professor at the University of Ottawa, an early supporter of the Media Lab at the Massachusetts Institute of Technology and guest-lecturer at ENST and EADS universities in France. A Killam Scholar, Sorin received a Ph.D. in Electrical Engineering from McMaster University, a M.Sc. in Physics from University of Calgary – both in Canada, and an M.Eng in Engineering Physics from the Polytechnic Institute of Bucharest, Romania.