

Entrepreneurship for the Bottom Billions

Disruptive Technologies and Social Services

Based on the Connected Opportunities NGO work on

Turning the Cellphone into an Antipoverty Vaccine

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Suggested Research Topics:

1. Constructive commitment of government aid agencies and philanthropies e.g. CIDA US AID, UN, ADB, Rockefeller, Ford foundation and others.
2. Creation of a cellphone “minutes bank” where currency is the cellphone minute
3. National regulatory issues & effective commitment of local governments
4. Economic deployment of networks in low density remote locations
5. Low cost wireless phones for illiterates – possibly icon based
6. Citizen Services: platform and tunable service opportunities with Cellular Service providers
7. Localization and User Identification as a civic or business service
8.

Introduction: Disruptive Innovation in Information & Communication Technologies

There are four billion people in our world who do not have reliable access to clean water, education or health care. Despite aid, they remain in a cycle of poverty. They are, the “bottom billions”. To serve the bottom billions we propose a “disruptive innovation” (to quote Clayton Christensen) to providing aid. This requires a radical departure from current thinking on poverty elimination by world aid agencies and philanthropies. Disruptive innovation rarely emerges from large established organizations. This happens in the governmental world as well as in the world of business, and established humanitarian organizations are as likely to miss worthwhile opportunities as their profit making counterparts. Large aids agencies are designed to be comfortable with sustaining know-how that maintain status quo. They know their markets and want to capitalize on the value of that knowledge. They don’t want to be distracted by risky “maybes”. The bottom line is this: despite spending 2.5 trillions of dollars in aids since 1950, the lives of the bottom billions have not improved. Our proposal, like almost all types of disruptive innovation in the world, comes from outside of the established humanitarian organizations or aid agencies and offers unconventional solutions, which makes it more challenging to implement.

At the dawn of the 21st century, a resolution was adopted by the United Nation General Assembly with specific goals of poverty reduction, increased access to education and clean drinking water, infant mortality reduction and several others basic needs - 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 truth is that, \$1-a-day remains the barometer for measuring poverty. There are 70 countries in the world,

for which the situation may change only by a fundamental re-structuring of their social infrastructure or by short-circuiting the established 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). The goal of this project is to develop the potential role of cellphone based services as an effective tool of economic emancipation and social improvement. Already, the cellphone is haphazardly used in this capacity: for example, in Nepal it has been reported that people use mobile phones to enhance the effectiveness of sales agents for poor farmers. In Kerala, fisherman use cellphones to find buyers for their daily catch, showing a relative economic improvement of between 10 and 50 percent. The disruptive innovation we propose addresses these issues exactly and opens up the possibilities to empower the bottom billions for economic and social betterment.

Information and communication technologies have yet to impact more than four billion poor and illiterate people who are still deprived of the basic means of economic, social and health betterment. The goal of this project is to develop the potential role of cellphone based services as an effective tool of economic emancipation and social improvement. Already, the cellphone is haphazardly used in this capacity: for example, in Nepal it has been reported that people use mobile phones to enhance the effectiveness of sales agents for poor farmers. In Kerala, fisherman use cellphones to find buyers for their daily catch, showing a relative economic improvement of between 10 and 50 percent. Now, we must harness this adoption of the cellphone in a top-down systemic way. This will require the rollout of a 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 was 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 (a) use inexpensive and readily available services to overcome illiteracy and (b) avoid the expensive complex web-based approaches. Naturally, the services will have to offer several classes of user interfaces, in order to satisfy different types of users and different types of devices. Furthermore, the services will have to, allow for evolution in step with the dynamic evolution of the population. Like all disruptive innovations preceding it, developing the cellphone services in this way is demanding - it must be cheaper, simpler, and may even be considered inferior to the highly sophisticated capabilities of current cellphones applications. Yet, there are four billion reasons to pursue this project.

Implementation Requirements

The provision of meaningful and cost-effective services to the huge, dispersed and diverse markets characteristic of poverty stricken regions will require a tremendously powerful and innovative "system". This system must consist of the appropriate Services Platform and a well engineered Cellular Network infrastructure plus, of course, the appropriate affordable cellphones. A system of this nature will be characterized by 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 video services;
- Iconic and/or SMS based services; not web-based services;
- 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 kinds of efficient local power systems.

Although voice centric cell phones in the developed world are rapidly being replaced by data centric smartphones, cell phone networks in developing economies are largely used for voice and low bandwidth SMS. In order to achieve the Connected Services Revolution, cell phones in poor countries must evolve into 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 four billion potential users should warrant such devices at an affordable price! Still, for industry and governments to successfully address the development and deployment of the services, networks, and affordable user devices, it will be necessary to address some fundamental issues; we have identified and will describe seven of these issues.

We have identified and will describe seven of these issues. Our challenge to you, tomorrow's leaders, is to engage in and pursue these challenges. Take on these challenges as research projects. Make recommendations and develop a business plan that addresses essential aspects of the bottom billions opportunities.

1. Constructive commitment of government aid agencies and philanthropies e.g. CIDA US AID, UN, ADB, Rockefeller, Ford foundation and others.
2. Creation of a cellphone “minutes bank” where currency is the cellphone minute
3. National regulatory issues & effective commitment of local governments
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Maybe the issues you seek to resolve are not on this list. So be it, but remember that there are few markets larger than the one addressing billions even if at the lower end of the scale. By servicing them, you raise the overall level of quality of life and create huge new markets and tremendous business opportunities.

1. Constructive commitment of government aid agencies and philanthropies e.g. CIDA US AID, UN, ADB, Rockefeller, Ford foundation and others.

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 and 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 who are largely illiterate 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.

2. The Cellphone Minute Trade and Bank Model - Creation of a cell phone minutes bank where currency is the cell phone minute

As it stands, the bottom billions of the world cannot afford cellphone services and thus are deprived of any connected opportunity to improve their situation. As these bottom billions cannot afford the services, network operators have not extended their services to them nor have the network operators made any concentrated effort to develop low-cost technologies that could service the bottom billions. To overcome this chicken-and-egg quandary, we propose the formation of a bank comprised of cellphone minutes, which will create a very strong incentive for both the network operator and equipment manufacturers to act. We have to encourage aid agencies and philanthropies to divert some of their traditional aid dollars to the cellphone minutes bank. In a nutshell, the model goes something like this: We set up a bank, the currency of which is the cellphone minute. We encourage aid agencies to invest their dollars in the bank, depositing cellphone minutes for future lending activities. Knowing that billions of cellphone minutes are available for potential use, network operators should act to extend their services in the area and cellphone manufacturers should act to develop low-cost hand held devices. The target agencies that we will engage to sell this idea of creating a cellphone minutes bank are: CIDA, USAID, the Red Cross, Bill Gates Foundation, Rockefeller Foundation, Ford Foundation and other agencies. This is a major component of the disruptive innovation we have discussed and is required to jump-start our project. We will also engage major telecommunication vendors and operators to pursue this initiative.

3. National Regulatory Issues & Effective Commitment of Local Government

To proceed successfully with 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 is the role of national, regional and local (municipal) governments?
- What kind of national regulations need to be put into force for permitting and enabling the creation of citizen services and the use of the cellphone for the economical and social empowerment of the bottom billions?
- 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.

4. Business Model for Self-Deployable Remote Network Extension - Economic deployment of networks for the remote location

The deployment of wireless networks over the last seven years has been very extensive in the developing and underdeveloped parts of the world. However, networks have yet to reach the areas that would serve the bottom billions. We need a low-cost robust base station to extend the current GSM macro networks into previously unreachable remote areas (typically rural villages) without making any compromises. The base station must be compatible with all existing handsets. In addition, it must have zero operating expenses and the power consumption must be less than 10% of current base stations (3000 watts), a feature that will lend itself to solar power. Other important features include low capital expenditure (targeting a price that is about 25% of the cost of a current base station) and the capacity to be transported by rugged means i.e. by camel, bullock, or horse and cart. The base station should be self-deployed i.e. if local people are given basic training, they should be able to easily install and maintain the base station, regardless of their education level.

A base station of this nature opens up a new rural telecom business model involving microfinance where wireless operators can partner with local entrepreneurs to accelerate deployment of the network and at the same time provide a livelihood to local entrepreneurs.

In 2007, Ericsson developed and deployed a low-energy, solar-driven, main-remote GSM base station to provide macro coverage in difficult to reach areas of Sumatra. Also in 2007, Motorola deployed its “Motorola Reach GSM Network Solution” in Namibia. According to Motorola, their base station is wind and solar powered, low-cost, requires minimal maintenance, and parts of the

solution can be manufactured locally. In 2008, Pakistani operator, Warid Telecom, deployed a solar powered macro base station from Huawei Technologies. These are all positive developments towards providing reliable telecommunications to rural areas.

A company called VNL, based in Delhi India, has a product that may meet all the requirements. This has to be investigated further, along with other suppliers. The Wall Street Journal's 2009 Technology Innovation Bronze Winner was VNL, India. The product that won the award is a solar powered base station for a mobile communications network that can be used to bring cellphone services to remote villages.

5. The business of affordable personal non-battery dependent handsets – Low-cost high functionality wireless handset

The bottom billions does not have access to electricity, and if they do, it is highly unreliable. Hence, the wireless handset must be solar powered and must be able to operate at extreme temperatures. It must also be waterproof and inexpensive (target less than \$25 per device). The handset must have the local capability to translate icon-based communications into voice audio files to overcome the illiteracy barrier. This icon-to-speech software must accommodate local dialects and ideally be developed with natural sounding voices.

In our initial investigation we found that KDDI and Sharp have teamed up to announce their new waterproof solar-powered mobile phone. The eco-friendly phone is featured with waterproof solar panels that are developed by Sharp. The phone comes with a battery that can be charged up to 80 percent using solar energy. The waterproof handset is expected to be available in June for the Japanese market.

The Korean electronics giant Samsung also introduced a solar powered mobile phone. The Samsung *Blue Earth* phone features a solar panel at the back of the phone where users can generate sufficient electronic power to operate the phone. The phone also features a so-called "Eco Mode". This energy-efficient mode will adjust screen brightness, backlight duration and Bluetooth usage to an optimized mode and reduce energy consumption substantially. Samsung showcased the *Blue Earth* phone at the 2009 Mobile World Congress in Barcelona. This new phone is expected to be available in the market in the second half of 2009.

Another Korean phone maker, LG Electronics, has a similar device that was also unveiled at the 2009 Mobile World Congress in Barcelona. The LG handset has a solar panel that covers its back. If recharged for ten minutes, the cellphone will be able to provide approximately three minutes of talk time. The solar panels recharge a conventional battery inside the device, as they are unable to provide enough energy alone to keep the phone working while talking.

The mobile telecommunications operator, Digicel Group, announced the launch of the new Coral-200-Solar, which ZTE (the manufacturer of Coral-200-Solar) claims as the world's first low-cost solar-powered handset, utilizing innovative technology from the Dutch-based innovator Intivation. Digicel released the new Coral-200-Solar solar powered mobile phone in selected markets last June 2009. The Digicel Group mainly operates in South America and the Caribbean islands.

Japan's DoCoMo announced last July 2009 that it developed a waterproof, solar powered hybrid mobile phone (chargeable by solar power and electricity). The handset is resistant to water sprays from all directions and can submerge to a depth of one meter. If the battery loses all charge, ten minutes of solar recharging will provide about one minute of use.

To overcome illiteracy the system requires visually-enhanced text messaging solutions and services from the mobile messaging platform that will allow users to incorporate images and icons

into their SMS. The product features must include a set of additional applications supporting different languages that allow easy integration into instant messaging platforms. The users can incorporate images that substitute words and phrases into their messages. This system will effectively overcome illiteracy and allow people from around the world to break down communication barriers.

Zlango, an Israel company, has developed this system and is a global leader in visually-enhanced text messaging solutions. It can support 20 different languages and is deployed in 12 countries. Customers include Portugal Telecom/TMN, Globe (Philippines), Kiyv Star (Ukraine), Celcom (Malaysia) and other mobile operators.

This fundamental building block of the system will require further investigation to scope the adaptability of the technology in our proposed applications. This will also require consultation with network operators to gain further know-how in implementing the system.

We have to evaluate the above options and others as they become available to select a wireless handset that will meet our requirements in terms of functionality and cost.

6. Hybrid Government-Industry Service implementation and provisioning

The Citizen Services Platform

The Citizen Services Platform (CSP) Secure massively scalable integrated server is based on open industry standards. The CSP is a complete, end-to-end, wireless digital media solution that allows instantaneous and automatic transmittal from any wireless device (cellular phone, PDA, or digital camera) to any other wireless or wired device. The CSP also supports peer-to-peer, device-to-server, and server-to-server communications, regardless of device type, device OS, or wireless network.

The Platform shall be designed to work on both today's and tomorrow's wireless networks. This is important because of the delays in deployment of 3G networks, and the fact that the upgrades to the 2.5G networks (in the CDMA and GSM worlds) provide an always-on packet-data connection with enough bandwidth to allow for real wireless data applications.

The handset manufacturers and wireless operators shall be able to rapidly leverage the CSP solution to deploy the next-generation of image sharing solutions on today's networks, with a guaranteed smooth transition to 2.5G and 3G networks.

CSP solutions shall be integrated with existing Short Message Services (SMS), WAP (Wireless Application Protocol), and iMODE (a wireless Internet service popular in Japan) infrastructures to support Visual Communications over current 2G networks, 2.5G networks, and emerging high-speed/high-bandwidth 3G networks. CSP shall have the capability to evolve as a Multimedia Messaging Service (MMS) solutions. MMS solutions allow users to take a photo, attach a text message, and instantly share the image with anyone in the world. CSP server technology shall optimize the images for high quality display based upon the resolution capabilities of the receiving device, while also ensuring complete delivery of the file.

The preliminary investigation suggests that LightSurf Using Java[™] Technology meets the requirements.

However during feasibility studies this has to be carefully evaluated to find the most cost effective robust technology solution for the Citizen Service Platform.

Design of *c-Services*©

Any attempt at simply adopting available services designed 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. Some examples may be of value here to simply illustrate the nature of such services and to start the process of defining them.

Implementation and management of “*c-Work-Mart*”© *Service*

This is a service designed for people (professionals, skilled workers, day laborers, domestic staff, as well as managers and employers) to make available their needs for work and their requests for work in order to find the best and most readily available match. In some countries, this service will have to be tailored for local (village, city district), regional, and national markets. For example, India has highly developed cities along with immensely sprawling and diverse rural areas; as such, a *c-work-mart* service will need to be tailored to accommodate all markets.

Here is an example of how the 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 to hire – let’s say a bricklayer, carpenter, 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.

Implementation and Management of “c-Medical”© Services

These are the services that provide access to health information and facilitate access to medical care depending on present location, time and emergency of the situation. Providing a service to improve the availability of medical care is very critical for the poor who live in rural regions where the nearest health worker is miles away. For example, patients in rural areas may not get the care they need simply because they do not have the means to locate the nearest health worker who may be at home, miles away, or helping the sick in another village. The c-Medical service empowers poor people living in remote areas to efficiently locate health workers and arrange for a patient visit.

With c-Medical services, the necessary medicines could be ordered and made available on request at short notice rather than allowing medicines to linger on city warehouse shelves past their due date. C-Medical services would cost less and do more to improve the health and safety of poor people than parachuting medicine indiscriminately on poor regions or building already under-serviced facilities where local elites dictate.

Moreover, the institutions funding the service (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. The issue of absenteeism and abandonment of duty would not happen if c-Medical services were available to the population at large. People would have the power to file a report and question the absence of health worker by simply notifying the appropriate authorities via c-Medical 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. A government’s judicious use of c-Services should eliminate barriers to poverty eradication and do 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 people living in poverty,
- Old age pensions,
- Ration card distribution,
- Voter IDs.

Many similar services could be conceived if there is the political will to implement 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-Wallet”©

for people with no fixed address and no capacity to engage in traditional banking transactions. The cellphone has already been adopted as a unique identification tool for many people. The *c-Wallet* services would build on this phenomenon and empower these nomads 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.

Initially, we planned for the pilot project to encompass only two c-services: “c-Work Mart” and “c-Medical services”. Through additional research, we realized that the c-services to be used in the pilot project should be defined at a later date by the prospective users themselves. Thus, the definition and the design of c-services will depend on the choice of the pilot site. For introducing medical services, we will solicit the full participation of Red Cross. As the pilot services become successful, other c-services will be gradually introduced.

7. Localization and User Identification Capabilities – a Civic or Business Service

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. 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.

While offering location-independent services, the cellphone also offers the capability of localizing the user in time and space as well as identifying it to some extent. This opens new vistas of services with strong economic and social benefits.

The issues that need to be addressed here relate to matters of information ownership, security, access control and, in effect, individual personal control. As usual technology can be used for the good or for the evil and one needs to manage this very carefully.

Still, there is a significant business and social enhancement opportunity here, and it needs proper addressing with the parties involved: governments, aid and personal rights agencies, cellular service providers and the appropriate business and political communities.

In conclusion...

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.

What business management aspect of the Connected Opportunities revolution and the Empowerment of the Bottom Billions would you like to pursue?