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The ICT4D 2.0 Manifesto:
Where Next for ICTs and International Development?

RICHARD HEEKS

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The ICT4D 2.0 Manifesto:
Where Next for ICTs and International Development?

Richard Heeks
Development Informatics Group
University of Manchester, UK

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Abstract[1]

ICT4D – the application of information and communication technologies for international development – is moving to a new phase. This will require new technologies, new approaches to innovation and implementation, new intellectual perspectives and, above all, a new view of the world's poor. All these must be understood if we are to harness digital technologies in the service of some of our world's most pressing problems.

This paper explains the phase change – from "ICT4D 1.0" to "ICT4D 2.0" – and its implications. The background to these phases is reviewed, charting the logic and chronology of applying ICTs in developing countries. The implications of the phase change are then analysed. First, in terms of new technology and application priorities. Then, in relation to new models of innovation we may need to embrace: from laboratory to collaborative to grassroots innovation. Next, in relation to new implementation models for funding, managing, and applying digital technology. Finally, the paper looks at necessary new worldviews to guide our thinking and our policies in this field; integrating perspectives from computer science, information systems and development studies. Additional commentaries and models provide a further set of rich insights into the future of ICT4D.

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[1] This paper is a development of an earlier article: ICT4D 2.0: the next phase of applying ICT for international development, *IEEE Computer*, 41(6), 26-33.

A. Why ICT4D?

Before proceeding, we should ask "why ICT4D"? Why should we give any priority to ICT application for the poor in developing countries?

First, there is a moral argument. Most informatics professionals spend their lives serving the needs of the world's wealthier corporations and individuals – to borrow bank robber Willie Sutton's phrase – "because that's where the money is". Yet seeking to squeeze a few extra ounces of productivity from firms that already perform relatively well, or save a few minutes in the life of a busy citizen pales in ethical importance compared to applying new technology to the mega-problems of the planet.

It is the poor of the world who are on the front-line of those problems. From climate change to conflict and terror; from disease to resource depletion – it is the poor in developing countries who suffer most. And, of course, they suffer from that other blot on the world's conscience – poverty – with more than half the global population living on less than two US dollars per day.

Then, there is enlightened self-interest. In a globalised world, the problems of the poor today can – through migration, terrorism, disease epidemics – become the problems of those at the top of the pyramid tomorrow. Conversely, as the poor get richer, they buy more of the goods and services that industrialised countries produce, ensuring a benefit to all from poverty reduction.

And finally there is personal self-interest. Compare designing a system for an African or Asian community to doing the same for a company in the global North. The former is quite simply more interesting – a richer, more satisfying, more colourful experience.

That answers the "why 4D" component but what about the "why ICT" half? Why invest in digital technologies rather than, say, a tubewell to allow access to water? The standard response is "we need to invest in both", arguing that development requires water <u>and</u> information and/or that ICTs can improve the planning and management of tubewell projects.

A more assertive response might give a macro-level answer. Economic, social and political life in the 21st century will be increasingly digital, and those without ICTs will be increasingly excluded. And it might give a micro-level answer. Ask poor communities or look at how they spend what little money they have – not always, but sometimes, they prioritise the ICT option.

B. From ICT4D 0.0 to ICT4D 1.0 to ICT4D 2.0

The first digital computer put to use in a developing country was installed in Kolkata in 1956 at the Indian Institute of Statistics for numerical calculation work[1]. From that early start until the 1990s, there were two application emphases in the use of computing for development. Initially, government was the key actor, and IT (as it then was, rather than ICT) was applied mainly to internal administrative functions of the public sector in developing countries. During the 1980s, the multinationals and

other firms came to the fore, and IT – epitomised by the advent of the microcomputer and its associated software – was seen as a tool for delivery of economic growth in the private sector. We might thus christen this "ICT4D 0.0" period IT4G – information technology for government; then overtaken by information technology for growth.

Two things happened in the 1990s that gave birth to what might recognisably be called ICT4D 1.0. The first was general availability of the Internet. The second was the Millennium Development Goals (MDGs).

The Internet sparked an upsurge of interest in ICTs, including a reinvigorated interest in how ICTs might be applied in developing countries. At the same time, international development began to move back up the political agenda. This move was given impetus by the search for concrete targets; emerging first as the International Development Goals in 1996, and then formalised as the MDGs by the September 2000 Millennium Declaration which sought particularly to reduce poverty, and improve health and education and gender equality.

The digital technologies of the 1990s, then, were new tools in search of a purpose. Development goals were new targets in search of a delivery mechanism. That these two should find each other and fall in love was not unexpected. They had a baby called "ICT4D", born in a flurry of publications, bodies, events, programmes and project funding: the 1998 World Development Report from the World Bank, highlighting the role of information, knowledge and ICTs in development; the creation by the G8 countries of the Digital Opportunities TaskForce in 2000, setting an agenda for action on ICT4D; and the World Summits on the Information Society held in Geneva in 2003 and Tunis in 2005, acting as key learning and policy-formation points along the ICT4D path.

The key actors became international development organisations and NGOs (non-governmental organisations); and the priority application of ICTs was to the MDGs. Centrally, the MDGs are about improving the lives of what Prahalad has called the "bottom of the pyramid": the three billion on the planet who live on an average of less than US$2 per day.

Addressing Needs of the Poor

There are three ways in which development actions can address needs of the poor:
- *Inclusive*: improving opportunities and services that cover all people, including the poor
- *Enabling*: supporting the policies or context that will improve the lives of the poor
- *Focused*: specifically targeting the rights, interests and needs of the poor

The initial phase of ICT4D incorporated all of these. For example, there were inclusive e-government initiatives aiming to increase delivery of public services via the Internet. And there were enabling actions on ICT governance, seeking to ensure that poor countries' interests were included in the global regimes that control the Internet and telecommunications traffic and tariffs. But most energies were reserved for focused projects: those that took ICTs into poor communities and which sought to deliver information and services that might address poverty, health, education and gender equality – the four areas that form the bulk of the MDGs. It is likely that this combined approach – inclusive, enabling, and focused – will remain under ICT4D 2.0. We may, though, see some rebalancing, with somewhat more recognition being given to the importance of governance in shaping the outcomes of ICT4D.

What Happened During ICT4D 1.0?
With timescales short and pressure to show tangible delivery, the development actors involved with ICT4D did what everyone does in such circumstances. They looked around for a quick, off-the-shelf solution that could be replicated in poor communities in developing countries.

Given that most poverty is located in rural areas, the model that fell into everyone's lap was the rural telecottage or telecentre which had been rolled-out in the European and North American periphery during the 1980s and early 1990s. Seen to mean a room or building with one or more Internet-connected PCs, this could be installed fairly quickly; could provide tangible evidence of achievement; could deliver information, communication and services to poor communities (and could provide sales for the ICT companies who were partners in most ICT4D forums). Thus a host of colourfully-named projects began rolling out from InforCauca in Colombia to CLICs in Mali to Gyandoot in India.

Naturally, ICT4D 1.0 was not solely restricted to telecentre projects. But the telecentre was the archetype for this period, stretching from the mid/late-1990s to the mid/late-2000s.

And what has been the outcome? Painting with a broad brush, we can sum up with three words: failure, restriction, and anecdote[2]. Each of these has led to specific lessons and new watchwords:

- *Sustainability*: given the failure of many ICT4D projects to deliver and/or survive, there is a new emphasis on ensuring the longevity of such projects.
- *Scalability*: given the limited reach of individual telecentre projects, there is a new search for scalable ICT4D solutions.
- *Evaluation*: given that ICT4D 1.0 was often held aloft by hype and uncorroborated, self-interested stories, there is a new concern with objective evaluation of impacts.

But, more generally, these outcomes of the first decade of ICT4D have led to a rolling re-appraisal of priorities, processes, and purposes. There is no sharp divide to mark out the first from the second phase of ICT4D – the latter began as the first lessons were being learned back in the 20th century. And there is no consensus on what ICT4D 2.0 looks like – that is an ongoing discussion.

Nonetheless, we can sketch out some of its component parts; a task that will be taken up in the rest of this paper.
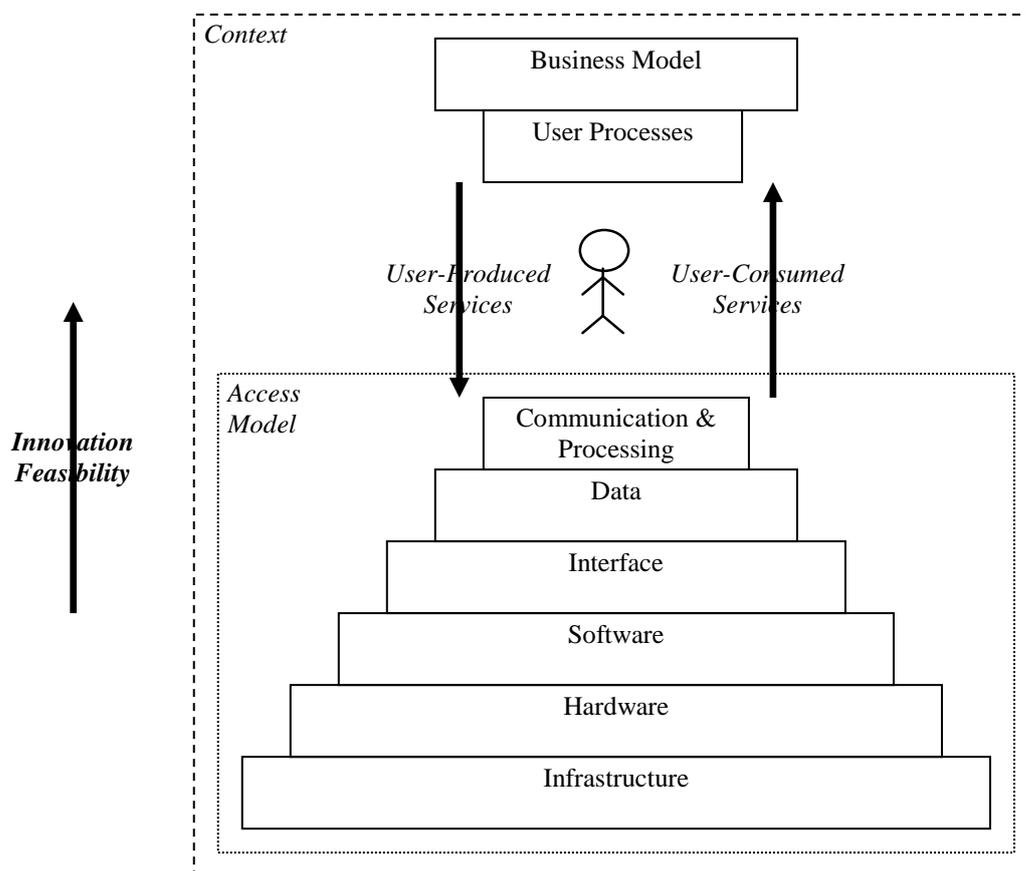
C. ICT4D 2.0's New Technological Priorities

Figure 1 provides an overview of the technology and processes of ICT4D. In this section, we will look at how some of these are likely to change in the coming years. Before plunging in, though, we will take a step back.

In his book *The Shock of the Old*, David Edgerton argues that we have been too obsessed with technology-as-invention, and too little focused on technology-in-use. Yet it is the latter that has made much more of a difference to people's lives.

The ICT4D field has certainly been prone to this. It has sought to surf each new wave of "technovelty". And ICT4D 1.0 initially took an invention-down approach – bringing new technologies into development contexts – much more than it took a use-up approach of understanding how existing technologies were being applied within poor communities.

Figure 1: The Technologies and Processes of ICT4D

Context

Business Model

User Processes

User-Produced Services   *User-Consumed Services*

Innovation Feasibility

Access Model

Communication & Processing

Data

Interface

Software

Hardware

Infrastructure

If ICT4D 2.0 does shift the invention—use balance, that would mean:
- Less emphasis on what might be used (the Internet and PCs), and more emphasis on what is actually used (mobiles, radio, television).
- Less emphasis on fundamental technical innovation; and more emphasis on application and business model innovation.

- Less emphasis on piloting and sustaining new applications, and more emphasis on assessing and scaling existing applications.

ICT4D Impact Assessment and Evaluation

Impact assessment and evaluation have always been the neglected children of the development family[3]. We fear looking back at the current project lest, like Lot's wife, we are turned into pillars of salt. Instead, we hasten on to the next project. Part of the problem is motivation, which is hard to alter, but part of the problem in ICT4D has been lack of guidance. Initiatives such as the Compendium on Impact Assessment of ICT-for-Development Projects[4], and the Global Impact Study[5] will help provide such guidance for ICT4D 2.0.

New Hardware

As we stand on the threshold of ICT4D 2.0, the key technical question to be answered currently appears to be: "How will we deliver the Internet to the remaining five billion?"

Back in the 1990s, the initial model was that serving the global North: a PC connected via a landline. But attempted roll-out faced major hurdles as the South's bottom of the pyramid proved far harder to reach. The model was too costly to be sustainable or scalable. And/or the necessary power and telecommunications foundations were often absent. Pushing forward the Internet-connected PC will therefore require hardware innovations in:

- *Terminals*: there are ongoing efforts to develop the type of low-spec, low-cost, robust terminal device that could work in large numbers of poor communities. The most high-profile of these is the One Laptop Per Child (OLPC) project's XO. Not coincidentally, a slew of relatively-similar devices is spewing forth. Some – like the PixelQi and the Intel Classmate – have a similar intention to target developing country needs. Others – Linutop, InkMedia, Elonex ONE, Asus Eee and many more – are more generalised commercial products. Despite twenty years of overpromising and underdelivering – from the "People's PC" to the Simputer – it seems low-cost terminals will be a central part of ICT4D 2.0.
- *Telecommunications*: wireless has become the delivery mode of choice to provide connectivity into poor communities in the global South. Interest in satellite-based forms such as VSAT during the 1980s and 1990s has given way to a focus on land-based transmission systems. In the same way, attention is turning from WiFi-based systems and innovation to WiMAX. The overriding innovation issue remains the relatively low traffic demand and low population density of most areas of rural poverty; requiring solutions that can deliver broader reach at lower cost than current technology.
- *Power*: with only 15 percent of rural households in sub-Saharan Africa having access to electricity[6], three areas of innovation continue to be required that take us through the power cycle – new, low-cost devices for local electricity generation; better ways to store, carry and transmit electricity; and lower power consumption by ICT devices.

> **Device Independence: Silver-Lined Cloud on the Horizon**
>
> Users take it for granted that they can access their email from anywhere: via any PC and increasingly via any mobile phone. Developments in server computing – including more infrastructure-independent notions such as cloud computing – mean the device independence of email is spreading to other applications. Office productivity tools such as word processing and spreadsheets along with associated file storage can be undertaken via central servers, including server-based cloud architectures. This fits well with the Southern pattern of shared ICT access where – for example in the local cybercafé – users cannot guarantee to be using the same client device every time. It also fits well with the spread of netbook-type devices, which can work as a variant of the old "thin client" idea. This model is now being extended to mobile phones. For example, Movirtu's MXShare provides device-independent mobile services, allowing users a virtual mobile phone number and account that can be accessed via a PIN from any phone.[7]

But, in some ways, we stand at a fork in the Internet access road. Do we still keep pushing down the PC-based route when less than 0.5 per cent of African villages have so far got a link this way[8]? Or do we jump ship to a technology that has already reached many poor communities – mobile telephony – which, for example, already reaches out to more than two-thirds of the African population[9]? Here the requirement for hardware innovations appears to be relatively limited. At least, one can say that to date the mobile phone offerings from multinational firms appear to be diffusing fairly readily. Half the world's population – stretching down into the bottom of the pyramid – are mobile phone users; a greater number have access to a mobile; and growth rates are currently fastest in the poorest regions.

Current growth rates will likely carry usage to well over 90% of the world's population[10], leaving the questions as those of reaching the last half-billion, and of the spread of Internet-enabled phones, given that most phones in poor communities are currently calls-and-SMS-only. For both these questions, the need for hardware innovation may re-emerge. There are also likely to be innovations as iPhone-and-apps-type developments on mobiles converge with netbook-type attempts to produce lower-cost PC-like terminal devices; ending with something like a "Blackberry-for-development".

> **Broadband: New Hope / New Divide**
>
> Broadband is already an integral part of ICT usage in the global North. In the US, for example (one of the poorer performers), by 2008, there were 25 broadband subscriptions per 100 citizens, and 55% of households had broadband, representing around 90% of all Internet connections.[11] By contrast, the subscription rates for most African countries including Ethiopia, Ghana, Kenya, and Uganda were well under 0.1% of the population. Tiny Andorra had roughly as many broadband subscriptions as Africa's most populous country, Nigeria.
>
> So, as we start seeing digital divides closing around Internet access and mobile phone ownership, a new broadband divide is growing. This is already – and will continuously – require a strategic response which, if not led, must at the least be coordinated by government. As and where this happens, the development results will be impressive. Broadband uptake is associated at the macro level with growth in indicators such as employment and GDP, and at the micro level there are many new employment- and productivity-enhancing opportunities.[12]

Most likely, in dealing with the "remaining five billion" issue, ICT4D 2.0 will simultaneously push along both the PC <u>and</u> the mobile route. But some have asked whether the Internet should be the focus. Or, should we look at where the poor have "voted with their wallets" and see whether the simpler, cheaper technologies already in use can deliver sufficient ICT functionality to make a difference. Rather than wait for handset and bandwidth upgrades to allow mobile Internet access, what can be achieved for development through calls and SMS? And what about older technologies? Access (as opposed to ownership or geographical coverage) figures are hard to come by, but we can estimate that something like 80% of the population in developing countries has access to a radio, and 50% to a television[13]. Hence, early in ICT4D's history, the reinterpretation of "ICTs" to incorporate radio and television.

And hence, too, the role that convergence will play in ICT4D 2.0. In practice, this means looking at the technologies that already penetrate – mobiles, radios, televisions – and seeking ways to add computing and Internet functionality. Pilot projects are already underway. Community radio stations seek answers to listener questions via email and the Web, and broadcast the response; as seen in Kothmale in Sri Lanka[14]. Telecentre databases add an SMS gateway that allows farmer searches in the field via mobile phone; as seen in Warana in India[15]. Many other such hub-and-spoke innovations are likely to find a valuable application in future.

ICT4D 2.0 and The Rise of the Individual

There has been a central difference between application of ICTs in industrialised and in developing countries. In the global North the dominant ICT ownership and use model of the past two decades has been first the household and more latterly the individual. In the global South, by contrast, the ownership and use model has been the community or the community group.

This model has inhered both conceptually and practically within almost every ICT4D 1.0 project. It has helped ensure far greater reach-per-device than simple extrapolations of Northern models suggest. The digital divide in the South has thus been overestimated because shared access to ICTs multiplies many times the basic technology ownership figures.[16] This model has also been the source of broader benefits of some projects, which have helped to form or strengthen community groups. Such groups – often facilitated by an "infomediary" trained from within the local community – for example consider the implications of information received (e.g. about child health or agricultural improvements) or, more latterly, participate in creating their own digital content.[17]

This will continue into ICT4D 2.0 but it is challenged by a rise in household and even individual ownership, particularly of mobile phones. Early phone projects took a one-phone-per-community model. But this is being overtaken as mobiles diffuse further. Mobiles are thus starting to substitute for some uses of community-owned ICTs and, as they slowly become portable radios, televisions, Web devices, etc, this substitution will only increase.

With substitution come disintermediation pressures and less need for groups and infomediaries. This may spark a new release of entrepreneurial uses of ICTs for development. But it may also have negative consequences. These include loss of community cohesion, and greater expression of intra-community and intra-household inequalities. We have already seen signs of the latter with the uptick in domestic violence associated with growing use of mobiles.[18] So ICT4D 2.0 will bring new challenges as well as new opportunities.

It will also bring greater pressures to stop homogenising "the poor" (as this paper does). Instead, there will be a greater need to differentiate groups with different needs and different vulnerabilities. The most obvious – partly recognised within ICT4D 1.0 – will be differentiation of men and women. Other differentiations – by location, by income, by age, and so on – may follow. The destination – taking seriously Amartya Sen's notion of "development as freedom" – may be to treat "the poor" as individuals.

New Applications
Moving upwards from the hardware core of ICT4D, we meet an issue that has been alive since at least the 1960s – that of interface design for development. It is a common mistake to equate the poor in developing countries with illiteracy. Adult literacy even in the very poorest countries of the world is still greater than 50 percent, and two-thirds of 15-24 year olds are literate.[19] Effectively, every community will have at least some literate members who can act as "infomediaries", thus massively multiplying the accessibility of written materials, online or otherwise. And literacy rates among the poor are steadily rising.

Nonetheless, interface innovation is still needed to drive access to ICT-based information, services and jobs. First, in the field of audio-visual interfaces. Second, though now covered for all the world's major languages, there is still some work to be done to create interfaces for all local languages.

Free and Open Source Software During ICT4D 2.0

Linking hardware and application is, of course, software. During ICT4D 1.0, free and open source software (FOSS) emerged as a potentially important instrument in delivering development-appropriate solutions. It brings the promise of systems that are lower-cost, more-robust, and more locally-customisable than some proprietary solutions. And it brings the promise of helping poorer countries develop local IT enterprises based on such FOSS customisation.

This promise has been threatened by the resemblance of parts of the FOSS community to a religious cult. Some have adopted a "with us or against us" mentality bordering on paranoia that has produced a welter of self-justification, but very little independent analysis. These FOSSers seem to feel users only have to hear the word of Stallman and they will be converted. Niceties like robust business models, rigorous total cost of ownership calculations, or user-friendliness can get forgotten. These perspectives might work behind the walls of Waco but in the real-world, such FOSS developers need to professionalise their act or be eaten for breakfast by more market-savvy players.

There are indications that some professionalisation is happening. The more rational, socialised fraction of FOSS is growing; challenging the inward-looking, technology-focused approach often adopted during 1.0. One outcome is the increasing use of FOSS in ICT4D systems, and the growth of FOSS-based ICT4D programmes, such as the Health Information Systems Programme, HISP. (Another is the growing fight-back from proprietary solution providers, a bellwether of which was the 2008 addition of a Windows version of the OLPC.)

Even if past and future innovations can provide access to ICTs for the majority world, the hardware-plus-interface combination remains an empty husk. When filled with applications software, that husk can have four main development roles: data content handler, interactive communicator, service deliverer, productive tool. These form a chronology of sorts as ICT4D moves slowly to close the gap between supply (what is easy to provide) and demand (what the bottom of the pyramid actually wants).

Content. It was rapidly recognised during ICT4D 1.0 that plugging a peasant farmer or slum-dweller into Google was of limited value. Much of the information they required would not emerge because it was not present in digital format. Hence, a series of projects, such as Open Knowledge Network, seeking to create relevant local data content focused on livelihood-appropriate issues such as health, education, agriculture, and rights. Hence, too, a recognition once media technologies like radio and television were incorporated into ICT4D, that their non-interactive and broad-

scale nature presented a problem of lack of specific data relevance. For these technologies, the phase change to ICT4D 2.0 is therefore associated with community radio[20] and, to a lesser extent, community television – very localised broadcasting that allows community input[21]. There is growth of participatory video – the creation of video content by the local community and its presentation at individual screenings for community groups.[22] We are also likely to see more content creation with an external purpose. This means use of locally-created data to raise awareness, action or funds from external groups as organisations like Kiva and Treatment Action Campaign currently do.

Falling Barriers to Data Conversion

One of the informational barriers faced by developing countries is that useful data content is in the wrong format for effective use. New technologies are reducing – and through innovation during ICT4D 2.0 will increasingly reduce – those barriers. Examples include:

- Audio/digital conversion through spoken dialogue and interactive voice response systems to offer development information[23], or speech recognition systems for literacy training[24].
- Text/digital conversion either directly via scanning to improve data entry speed and accuracy[25] or enabling conversion to digital speech or Braille output[26].
- Conversion of mental representations to digital maps to capture local knowledge[27].
- Conversion of physical measurement data to digital format on low-cost sensor devices such as for blood tests[28], heart monitoring[29] and agricultural management[30].

Interaction. There was quite a fuss made in this domain about dealing with "ICT not IT" i.e. technology "now with added C". Despite this, use of technology for communication – at least, for interactive communication – has been a late arrival. This may be because, faced with the telecentre model, interaction meant email, and the poor had no-one to message. Their social networks were seen as small, local and informal. In fact, as take-up of mobile phones proved, these networks have been extended by rural-to-urban and international migration. And they might be extended further by the new technology, thus adding to the social capital of the marginalised majority. How this can be done, and how the interactive communications capabilities of digital media can best be exploited, remains a growing task for ICT4D 2.0.

ICT4D 2.0 and the Demographic Tipping Point

Some time in 2008, the world passed a demographic tipping point. From then on, more than half the world's population live in urban rather than rural areas. Granted, Asia and Africa will not pass the tipping point before 2030, and numbers in urban poverty are likely to exceed those living rurally only by 2040 or later: 75% of those currently living on US$2 per day are in rural areas.[31]

However, that still leaves 800 million urban dwellers surviving on less than US$2 per day. And – thanks to rural—urban linkages such as remittances – we know that addressing urban poverty also reduces rural poverty. Urban areas are also more likely to have resources that allow ICT4D projects to succeed; more likely to have the client base that allows productive uses of ICTs; and more likely to be the locus of grassroots, "per-poor" ICT innovation (see below).

Yet ICT4D 1.0 seems to have done relatively little about urban poverty. Collations on telecentre projects, for example, show the great majority of such projects were launched in rural locations.[32] They also show telecentres sometimes conceptualised as tools associated only with rural development.

Work applying ICTs to rural development must continue. But ICT4D 2.0 is likely to give more space to the relation between ICTs and urban poverty alleviation.

Services. Just as Web models move from informational to interactional to transactional stages, so ICT4D has recently moved to look at delivery of service transactions for the poor. To date, this has targeted e-government: enabling bill payments via telecentres, or helping order important certificates. After some years of problematic pilot projects, this now seems to be delivering measurable benefits.[33] However, the limited reach of the telecentre model constrains the impact of such innovations and ICT4D 2.0 seems likely to take forward "m-development": finding ways to hang relevant services onto the growing mobile base. For the moment, this means exploiting existing functionality such as use of SMS for tasks ranging from reminding people living with AIDS to take their anti-retrovirals, to monitoring elections. From here forwards, it means adding further functionality, such as "banking the unbanked": using mobiles to deliver financial and banking services to those currently excluded from the mainstream.[34]

IS in DCs vs. ICT4D: Beyond the MDGs to Business-for-Development

If known as anything, this field during phase 0 was known as "information systems in developing countries: IS in DCs". It was a broad church, defined by the geographical location of the technology rather than its purpose. ICT4D is much narrower, for example excluding almost all ICT applications in business in developing countries. Yet those businesses are fundamental – and increasingly important – in generating the wealth, jobs, skills, etc that are a foundation for socio-economic development.[35]

One question for ICT4D2.0 will be its relationship to the broader IS in DCs field. Should, and can, it recognise the contribution of business to development, and hence of ICTs to business?

Beyond the MDGs to ICTs for Resilient Development

Three major issues that have worked their way up the development agenda in the years since the MDGs and the start of ICT4D 1.0 are:
- Security, including terrorism.
- Economic growth, including its variability and fragility as demonstrated by the post-credit-crunch recession and slow recovery.
- Environmental sustainability, particularly climate change.

In the medium term of ICT4D 2.0, climate change may well form the single largest item on the development agenda. But all three issues can be grouped together into the notion of "resilient development", and they drive some key questions for the next phase of ICT4D 2.0:
- How can ICTs ensure development that is resilient in the face of threats such as insecurity, economic fluctuation, and climate change?
- How can ICTs provide development that is sustainable?

That ICTs will form a key part of this development agenda seems beyond doubt: for example, ICTs have been central to both the organisation of terrorism and counter-terrorism; ICT-based enterprise and use of ICT in enterprise is now a keystone for economic growth and recovery; and ICTs are an integral part of "greener" technologies (though also of the growing issue of "e-waste"), of mapping climate change, and in assisting communities adapting to climate change.

Production. ICTs seem well understood as tools for delivering information and services to the world's poor. Where they have so far been little understood is as tools the poor can use to create new incomes and new jobs. This new productive view is partly encompassed when the poor act as authors of data content; as seen in community radio and participatory video projects. As well as delivering relevant content, these also empower by making those involved into participative creators; able

to take control of these means of production for the 21st century. Can this now spread further to encompass all of Web 2.0 – can bloggers, and mashers, and wiki-writers be drawn from the ranks of the world's most disadvantaged? And will this require new applications to achieve?

The sense of empowerment and inclusion that come from content creation are valuable. But the number one priority for the poor is typically income and employment. Here we are only just waking up to the possibilities. Mobiles are widespread. To date the poor have created incomes both around the technology – selling accessories; selling pre-pay cards – and via the technology – selling or taking calls. But are there novel ICT-enabled microenterprises that could be developed? This is already happening around some rural and urban telecentres with "social outsourcing": the outsourcing of IT services to social enterprises based in poor communities.[36] But a priority for ICT4D 2.0 will be conceiving new applications and new business models that can use the growing ICT base – of mobiles, of telecentres, and so forth – to create employment.

ICT4D and the Creative Industries

The "creative economy" – "a vast and heterogeneous field dealing with the interplay of various creative activities ranging from traditional arts and crafts, publishing, music, and visual and performing arts to more technology-intensive and services-oriented groups of activities such as film, television and radio broadcasting, new media and design"[37] – is seen to provide a growing opportunity for developing countries. These countries are seen as already rich in traditional creative industries, and as providing a low-cost base for new creative industries.

During ICT4D 2.0, digital technology is likely to provide a foundation for growth of both parts of the sector. ICTs are already finding application in traditional sectors such as greater marketing of craft goods[38] and recording and sales of music[39]. ICTs are also fundamental to new media work, including the growth of outsourced jobs in animation, gaming, and the like.[40]

D. ICT4D 2.0's New Innovation Models

Underlying the discussion above are two different views about technology and development – or, at least, two extremes on a continuum. At one end we have the "passive diffusion" view. Taking the lead from mobile telephony's rapid spread, this says that if ICTs do have a developmental value for the poor, then a combination of private firms' search for profit plus the poor's search for value will make it happen. Any attempt to intervene from outside is foolish and wasteful: a force-feeding of the inappropriate that will only lead to messy regurgitation. Conversely, the "active innovation" perspective feels the market will not deliver – or will deliver too slowly – to the poor. Hence, intervention is required; intervention in the form of new innovations that will better help to meet development goals.

This paper will not compare these views in any detail. Certainly active innovation took a knock during ICT4D 1.0. There is a sense that international donor agencies subsidised the unsustainable, and were footling around in the supply-driven telecentre pond, oblivious to the market-driven mobile tsunami around them. On the other hand, non-market interventions have been the root of many subsequently marketised technologies. From the first computers to the origins of the Internet to the competitors spawned by the OLPC XO, active innovation has often been the foundation for passive diffusion. Finally, the two perspectives converge when private firms take the bottom of the pyramid notion to heart and start designing products specifically with poor consumers in mind (often changing the terminology as they do so from "developing countries" to "emerging markets").

What we can conclude is that some element of active innovation is likely to remain in the ICT4D field. In that case, two key questions ensue.

First, what to innovate. As the OLPC experience demonstrates, large-scale hardware and operating system innovations specifically targeted at the bottom of the pyramid are risky ventures, only for the very brave or the very foolish. In a moderated way, that even applies to the large private sector players. Instead, most ICT4D 2.0 innovation looks likely to occur on a smaller scale either in adapting or in applying existing technologies. Put another way, innovation appears more feasible (though perhaps more localised) as one moves up the chain from new telecoms/power infrastructure to new hardware to new software to new data content to new business models and processes (see Figure 1).

Second, how to innovate. In terms of the innovation process, we can educe three different modes, here labelled laboratory (pro-poor), collaborative (para-poor), and grassroots (per-poor):

"Laboratory" (pro-poor) innovation is that done outside of poor communities but on behalf of the poor. Telecentres began this way and the OLPC was largely designed this way. This can be an effective approach for engaging resources from the global North in developing country problems. However, it runs into the danger of "design—reality gaps": a mismatch between the assumptions and requirements built into the design, and the on-the-ground realities of poor communities.

The jury is still out on whether the various low-cost terminal devices will fall into this gap trap. But initial telecentre models surely did. And when there's a large design—reality gap, the outcome is almost certain failure.[41] Hence, the widespread lack of success and sustainability reported for telecentre projects.[42] Nonetheless, there will still be a space for pro-poor innovation in ICT4D 2.0. For example, innovative pro-poor pricing models have worked. Pre-paid for mobiles has been an essential part of their uptake in the developing world, and no doubt Microsoft's US$3 Student Innovation Suite software package for developing countries will also prove popular.

"Collaborative" (para-poor) innovation is that done working alongside poor communities. Its use has grown during ICT4D 1.0 and it will be central to ICT4D 2.0. The need for participative, user-engaged design processes was a key learning point of the first phase. It's a lesson the informatics discipline generally learnt several decades ago, but there is always a need to reinvent such wheels when new application areas arise, filled as they are by a goldrush of new actors.

Being learnt more slowly – though recognised in development studies in the 1990s – is the lesson that community participation in project design is fraught with pitfalls.[43] Who participates matters – often a very small, vocal, elite minority. How they participate matters – individual and group processes produce different results. Why they participate matters – participants often give the answers they think the designers want to hear. And why they do not participate matters – low self-efficacy among some developing country groups may stymie effective design input.[44] The very nature of ICT4D participation is also difficult because it requires multiple divides between designer and user to be bridged: techie vs. non-techie; rich vs. poor; often Western vs. non-Western mindset. And for certain projects, urban vs. rural; men vs. women.

ICT4D's New Innovation Intermediaries

A variety of organisational arrangements can exist between ICT system designers and would-be users in poor communities. Traditionally, these have been temporary – an informal grouping that lasts during the period of design and initial implementation, and then dissolves.

However, the growth of ICT4D and the growth of the poor as a market for ICT systems, has led to emergence of some more permanent organisational forms: what we can call ICT4D's "new innovation intermediaries". Taking one of the world's ICT4D hubs – Bangalore – we can cite three archetypes that are likely to play a growing role during ICT4D 2.0:

- *Direct private sector*. Microsoft Research (India) has developed relations with a set of poor communities through which innovations can be piloted. Learning from such pilots can then be fed back to other parts of Microsoft.
- *Indirect private sector*. The Centre for Knowledge Societies is a contractor that works on behalf of large private firms. Using a mix of anthropological and technological study methods within poor communities, it can report back to its clients on key ICT design and use issues.
- *NGO sector*. IT for Change works intensively in a small number of rural communities. It can then partner with outside agencies – typically international development agencies – to offer guidance on design good practice.

A mention should also go to the work of the technology-focused NGO Practical Action. Starting with a UK-based model of pro-poor innovation, it moved during the 1980s and 1990s to a collaborative, para-poor model. It has now begun, for example through its PROLINNOVA programme, to capture and disseminate the inventions of local innovators.[45] This is not yet done in the ICT field but it offers a model for the role intermediary organisations can play in grassroots, per-poor innovation.

"Grassroots" (per-poor) innovation is innovation by and within poor communities. In the 1990s, it was hardly a possibility – there was insufficient contact between poor users and the new technologies; old information technologies like radio and TV provided no innovative space. But this has changed in the last few years. As mobiles have arrived, and as PCs and the Web start to arrive, the poor have themselves become innovators. Not in the traditional laboratory/R&D sense of the term. But in the sense of adapting and applying the technology in new ways.

By and large we have only anecdotes to date about:
- *New processes* e.g. beeping (or flashing) that allows a message to be communicated without the call being completed. Street vendors use this to receive free "I want to buy now" messages from known customers.
- *New business models* e.g. use of airtime as currency has allowed mobile phones to metamorphose into mobile wallets. Those who own phones in poor communities have therefore been able to use them for payments or for receipt of remittances from distant relatives.
- *New products* e.g. back-street rechipping of phones. Informal-sector enterprises are emerging that strip and resell the circuitry from high-end phones, replacing it with basic calls-and-SMS-only functionality. They then sell the resulting high-end-body-with-low-end-organs as a unique hybrid for those who want the latest look but lack the budget to match.

As the weight of such anecdotes grows, there will be pressure within ICT4D 2.0 for more systematic means to "harvest" grassroots innovations. This is something well-practised within the appropriate technology movement. This movement has already been through its cascade from pro- to para- to per-poor innovation, and has evolved methods for capture, assessment and scaling of new ideas from poor communities. Such methods may arguably be enhanced during ICT4D 2.0 by adding features from open source and Web 2.0 innovation models.

Jugaad – Poverty is the Mother of Invention

As well as asking what and how to innovate, we could also ask: "why innovate?". For those working in and with poor communities, the answer is: because you have to. Technologies from the "outside world" fail to work at all, fail to work properly, and break. Hence, the North Indian concept of *jugaad* – the improvised quick-fix to get or keep technology working within an environment of relative poverty and resource constraints.[46]

Although the terminology may be localised, we can see *jugaad* in poor communities worldwide: minor innovations conducted within an environment of constraints. And that can lead us one step further, taking up the observation that resource poverty may be more of a spur to innovation than resource abundance.[47] We thus arrive at the notion for ICT4D 2.0 of constraint-driven innovation – what Prahalad pictures as innovation within a sandbox of constraining walls; innovation that delivers specialised solutions which match the available resources in a way that "mainstream" innovations fail to do.[48] They are lower in price, lower in capital intensity, lower in skill intensity, make greater use of local materials, and are more adaptable to sporadic availability. In sum, they close the "design—reality gaps" that other innovations suffer, and they demonstrate that poverty can drive innovation.

E. ICT4D 2.0's New Implementation Models

The two previous sections have focused mainly on the technologies of ICT4D 2.0: the main platforms, the main applications, the ways in which these will be innovated. In this section, I turn to look at how these new technologies will be put into action; thus focusing on various aspects of the way in which ICT4D will be implemented.

Funding ICT4D 2.0

ICT4D 1.0 was driven by money from a relatively small number of international development agencies. ICT4D 2.0 looks set to be funded by a much more eclectic range of sources:

- *Private sector*. Private firms are increasingly investing in ICT4D for reasons which appear to lie at the rather murky interface between CSR (corporate social responsibility) and BOP (seeing the poor as bottom of the pyramid consumers). The investments of multinationals like Cisco, Hewlett-Packard, Intel and Microsoft in shifting kit into poor communities are well known. A bit less recognised are the growing developmental investments of IT firms from the South like Datamation and Wipro. There are also commercial operators setting up their own ICT facilities in poor communities like Drishtee and N-Logue.
- *Southern governments*. Previously – and still somewhat – reliant on donor funding in this area, some governments in the South are starting to invest their own funds in ICT4D, drawn by the push of community demand and the pull of perceived benefits.
- *New donors*. The 21st century is seeing a new wave of Southern aid donors emerging. Countries such as China, India and South Korea are now active in development aid and – given their own economies and expertise – they have been particularly keen on funding ICT4D; arguably more so than some Northern donors.[49]
- *Revived old donors*. Funding for ICT4D from Northern and international (i.e. Northern-dominated) donors has followed a dot.com-like cycle. It ramped up massively from the late 1990s; fell away after the 2005 Tunis World Summit on the Information Society; and showed signs of reviving from 2008 with, for example, the UK's Department for International Development placing ICTs back onto its agenda and the World Bank doubling its funding for African ICT initiatives.

As new funders enter, we see signs that they repeat the mistakes of the past.[50] Thus a key task for ICT4D's second phase will be finding ways to incentivise and facilitate learning by new entrants.

This is vital in a broader sense because of the large sums being spent. Development agencies like the World Bank, the US Agency for International Development, Japan's International Cooperation Agency, etc spend at least US$2bn per year on ICTs for developing countries.[51] Private sector investments in ICTs and developing countries – not least the mobile infrastructure – are far larger; for example, US$10bn per year in Africa alone on mobile. And the overall figures are far higher still. In 2007, for example, low- and middle-income countries spent around 6% of GDP on ICTs; totalling more than US$800bn.

Implementing ICT4D 2.0

New Actors. ICT4D 1.0 was largely implementing by international or national NGOs. They will continue to play a key role in ICT4D 2.0, but seem likely to be joined by others:

- *Private firms*. As ICT4D investment and ICT4D infrastructure grow, more commercial implementers are entering the fray to stand alongside the typical donor-funded consultants. Some were mentioned above. Other examples would be firms like Fundamo in South Africa and Globe in the Philippines, which act as foundations for "m-development" applications. At the grassroots, too, there is likely to be a growing emphasis on micro-enterprise; so perhaps less talk of telecentres and more talk of cybercafés.
- *Partnerships*. "Partnerships" have always been a development buzz-word but they have pushed up the ICT4D agenda.[52] There are public-private partnerships. An example would be that between government and private sector implementers in Lebanon's e-education, e-government, and e-enterprise initiatives.[53] And there are multi-stakeholder partnerships, such as those created to implement UN ESCWA's Smart Communities Project which are drawn from national and local government, local NGOs and community representatives.
- *Virtual organisations*. Somewhat at "left field", virtuality is allowing development activities to happen at a distance. Kiva allows anyone Internet-connected to loan money to developing country entrepreneurs.[54] UN Online Volunteering allows similar virtual contributions to ICT4D projects.[55] It is yet unclear what expanded role this may play in ICT4D2.0 and the big prize still remains unclaimed: finding a way for us to "do development" while in Second Life or World of Warcraft!

As these new actors and their new organisational forms play a greater role in ICT4D, it will be important to recognise that they bring different interests and different relations with user communities.

New Approaches: From Blueprint to Process. Some of the key causes of ICT4D 1.0 project failure can be summarised.[56] These include project designs that draw solely from the understanding of designers rather than users; very rigid project implementation that does not deviate from the initial top-down plans; an inability to build appropriate knowledge that could help the project; a narrow reliance on external resources; and poor project leadership. These are also the constituent criticisms of the "blueprint" approach to development projects suggesting, instead, that ICT4D 2.0 projects could benefit from taking more of a "process" approach.[57]

A process approach to ICT4D projects would include:
- Participation of beneficiaries in the design and/or construction of the ICT4D project.
- Flexibility and improvisation in the implementation of the ICT4D project.
- Learning in order to improve implementation of the ICT4D project (embracing both learning from past experience and iterative learning-by-doing during the project).
- Utilising and building local capacities including those of local institutions.
- Competent leadership of the ICT4D project that is able to promote the other four elements.

> **Needs vs. Wants on ICT4D Projects**
>
> During ICT4D 1.0, it seems that project designers often focused ICT application on a top-down determination of needs, rather than a bottom-up statement of wants. Projects were designed around a standard information needs template that said communities needed better access to information on health, education, governance, etc. However, when community members can freely discuss what they want from ICT, priority items are often a mix of help with new income and employment, and entertainment.[58]
>
> The Namma Dhwani project in South India exemplifies the contrast. Community radio loudspeakers were wired up around the village to broadcast "developmental" information. Villagers were not happy about this and, at one point, the wires were cut and speakers linked up to a mobile sound system to broadcast music as a statue of Lord Ganesha was paraded around the village for a local festival. The former use of ICT was seen as one the community needed. The latter was what they wanted.
>
> Where projects focus on needs, they can suffer from low usage (and hence low impact), subversion and a lack of sustainability. Where projects – as, for example, in the case of some N-Logue kiosks in India – allow ICT usage to focus on wants, the opposite tends to happen.[59]
>
> Of course there is a balance to be struck here, but a less paternalistic view of project beneficiaries will be valuable in ICT4D 2.0, as will an understanding that fulfilment of wants – as already noted above, we can think of this in terms of Amartya Sen's "development as freedom" – can be at least partly developmental.

New Techniques: Closing Design—Reality Gaps. Analysis of ICT4D 1.0 project failures also shows that a single underlying model can be used to explain that failure: the design—reality gap model. This demonstrates that failures are associated with a large gap between design expectations, and the actual realities of the project and its context.[60] For problematic projects such large gaps are found on one or more of a set of dimensions, summarised by the ITPOSMO acronym, and shown in Figure 2.
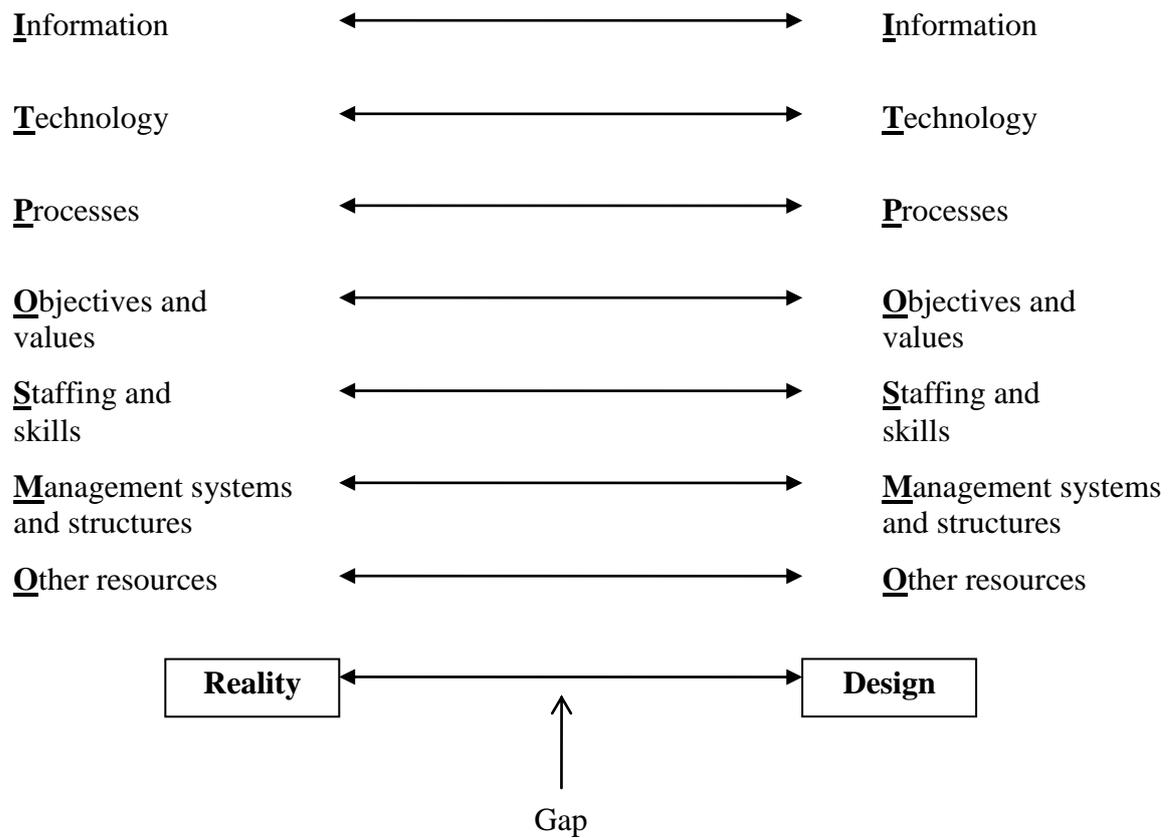
Drawing from the model, techniques to identify ICT4D project risks can be applied before, during and after the project. At all three times, the scores obtained can be used for risk identification. In the first two cases, they can also be used to predict likely project outcome, and to identify risk mitigation actions.[61]

Such actions may be dimension-specific: to change the technology design, or to improve the reality of current skills, for example. But these actions could also be more generic thus acting as a more general guide to ICT4D 2.0 good practice. Examples would include:

- Mapping project realities: finding ways to expose the true situation within the project context, and integrate that into implementation processes. One example would be the use of soft systems techniques, such as "rich pictures", which have a good track record of mapping realities.[62]
- Using hybrids: hybrid ICT4D professionals are those who combine an understanding of technology, systems and development (see Figure 4 further below), and thus help to recognise and reduce gaps.
- Being incremental: breaking the overall ICT4D project down into smaller steps and therefore reducing the extent of gap between design and reality that is undergone at any one time.
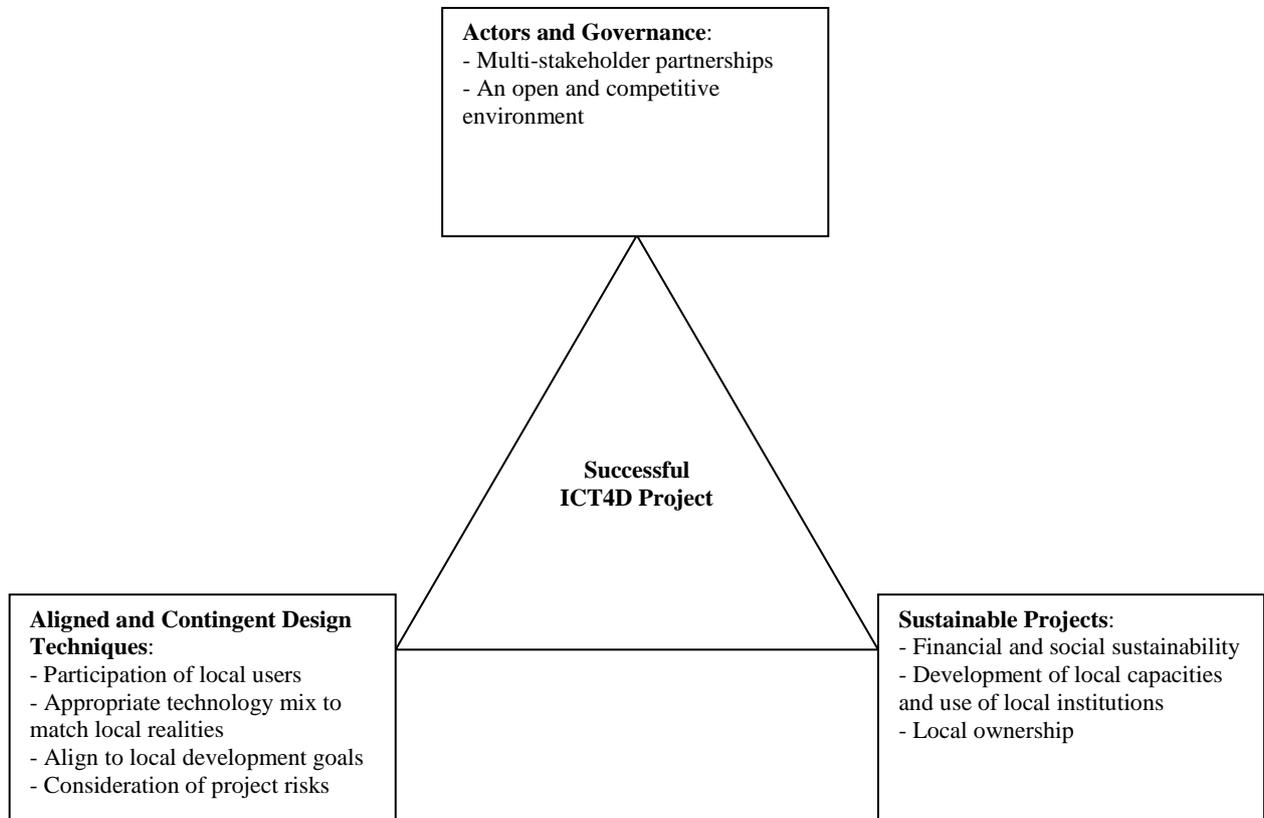
Figure 2: Design—Reality Gaps in ICT4D Projects

Information	← →	**I**nformation
Technology	← →	**T**echnology
Processes	← →	**P**rocesses
Objectives and values	← →	**O**bjectives and values
Staffing and skills	← →	**S**taffing and skills
Management systems and structures	← →	**M**anagement systems and structures
Other resources	← →	**O**ther resources

Reality ← → **Design**

↑

Gap

In addition, the process approach described above can demonstrably be shown to help close gaps because of the way it exposes project realities, and enables flexible and iterative changes to both design and reality.

Putting this all together, we find something very like the guidance for ICT4D project strategy in Figure 3, which draws together lessons from ICT4D 1.0.[63]

Figure 3: Good Practice for ICT4D 2.0 Implementation

Actors and Governance:
- Multi-stakeholder partnerships
- An open and competitive environment

**Successful
ICT4D Project**

Aligned and Contingent Design Techniques:
- Participation of local users
- Appropriate technology mix to match local realities
- Align to local development goals
- Consideration of project risks

Sustainable Projects:
- Financial and social sustainability
- Development of local capacities and use of local institutions
- Local ownership

F. ICT4D 2.0's New Worldviews for Action

The key actors in the ICT4D field are drawn from particular disciplinary worldviews. What can we learn by looking at their backgrounds?

Many of those active in the field draw from a computer science background. Some from what we might call the "harder" end dealing with hardware and firmware, some from the somewhat "softer" ground of human—computer interaction. Such expertise is, of course, essential to ICT4D 2.0. It will be essential to delivering the new technological and application priorities detailed above. It will be an essential part of laboratory/pro-poor and collaborative/para-poor innovation.

But, alone, it is not enough. And, where it stands alone, problems arise. The root of a number of ICT4D failures is identified as their techno-centric approach, dominated by an informatics worldview.[64] Such projects are often analogous to the old medical joke, "The operation was a success but unfortunately the patient died". They deliver a system that works technically but which fails to make a developmental contribution.

To move from the failures of ICT4D 1.0, then, we need to have new, broader worldviews guiding ICT4D 2.0 projects. But where will those broader worldviews come from? There are two main disciplinary candidates.

The first is information systems. During the 1980s and early 1990s, information systems was the intellectual home of ICT4D before it was called ICT4D; particularly within the work of IFIP's working group 9.4 on social implications of computers in developing countries. This has strengthened with the creation of IS discipline journals dealing solely with ICT4D; with new editorial board members on key IS journals being appointed with a specific developing country remit; and, most recently, with the Association for Information Systems' creation of a special interest group on IS in developing countries.

An information systems perspective offers the means to understand many of the problems that beset ICT4D projects. Most notably, it offers models for understanding the human, political, contextual reasons why so many ICT4D projects fail. And it offers approaches for addressing those factors during project design and implementation. At its widest setting, information systems even permits us to step right back and answer questions about the political economy of ICT4D: whose interests it promotes, and what its opportunity costs are.

But the information systems perspective falls down in two ways. It has at least in part lost track of the artefact, becoming so much of a social science and so concerned with context, that it fails to engage with the technology.[65] And it has made few connections with the context, stakeholders and process of development. Information systems tends neither to understand, nor use the ideas of, development studies.

What About Communication Studies?

We could argue for incorporation of a fourth worldview: communication studies. It has housed interests in development for decades and provides a key part of the ICT4D community. For simplicity, we will here view its key concepts as incorporated into information systems: a simplification more credible for communication models and telecommunications; less so in studying media.

It is to development studies that we then turn. Development studies has so far failed to adequately conceive or support ICT4D. In part, this has happened because development studies turned away from technology generally in the 1980s; a counter-reaction to the "big science" and "technology transfer" ideas that characterised the by-then-discredited paradigms which had dominated development in earlier decades. As a result, ICT4D 1.0 grew as something of a bubble. It was driven by actors external to the development field, such as IT vendors, and by a few believers within that field. But it was isolated from the development mainstream who remained sceptical about technology, especially new technology (despite the fact that, in their own homes and workplaces, they increasingly relied on that technology).

As the 2000s progress, though, things have changed in development studies. Science and technology are moving back up the development agenda, driven by human development champions such as Jeffrey Sachs who see technology as central to achieving the MDGs; by the central importance given to science and technology by the NICs (newly-industrialised countries like Korea and Taiwan) and BRICs (Brazil, Russia, India, China) that are emerging as economic powers and as new aid donors; and by new perspectives on technological innovation that show how it can be effective in addressing the problems of the poor[66].

There are thus greater opportunities within ICT4D 2.0 for engagement with development studies. This is an engagement that will help understand where digital technologies fit into development paradigms, processes and structures. Not only can this guide post-hoc activities like ICT4D impact assessment, it can also guide pre-hoc activities that seek to understand ICT4D priorities, and ICT4D project design and implementation good practice. A development studies perspective thus provides guidance at both a macro and micro level, all ultimately increasing the likely contribution of ICTs to development.

From Modernisation to Development 2.0: Phases in Development's Views on Technology

Modernisation was a philosophy of development that dominated the third quarter of the twentieth century and thus also the initial years of applying IT to development. It saw nations of the global North as advanced and modern; and nations of the global South as underdeveloped and backward. To make development happen, the "underdeveloped" countries must transfer technology, ideas and values from those who had already industrialised.

Not surprisingly, this turned out to be a very problematic process. Thus, leavened with a sprinkling of Marxist philosophy, a new development idea was born. This was the "dependency" paradigm, which argued development happened best when countries broke away from an exploitative world system. Hence, during the 1970s, barriers to imports were raised and the ablest developing nations sought to create their own technologies. India, for example, began designing and building minicomputers, impelled partly by IBM's departure from the country in 1978.

In its turn, though, this dependency model was found to have feet of clay. Attempting to build local technologies that would substitute for imports was good for the technology producers. They built capabilities and profits (often with the help of generous government subsidies). But their local customers suffered with goods of high cost and low quality that were several years behind the technological frontier.

And so, a new leitmotif was born: "neo-liberalism". In many ways this was a return to modernisation, with an emphasis on ready transfer of technology from North to South. But this time to be achieved not through the guiding hand of government so much as by market forces. The 1980s and early 1990s therefore saw a freer flow of technology in the world, helping act as the carrier wave for the growth of

market globalisation. But it also saw the erosion of some of the bases of technological capabilities that developing countries had built up during their more protected years.

Neo-liberalism was also argued to ignore the needs of the poorest, who were often seen to remain excluded from markets and their benefits, or adversely incorporated into markets which acted as institutions of exploitation not liberation. Some of these concerns were given particular voice when the ideas of Amartya Sen and others gave rise to the "human development" paradigm that placed a priority on delivering health, educational, income and related improvements to the mass of citizens in developing countries. Such ideas guided the Millennium Development Goals which, as seen, were key shapers of ICT4D application during phase 1.0. An as-yet-unfulfilled task for phase 2.0 is to operationalise Sen's deeper ideas on capabilities and functionings in ICT4D terms: to understand how digital technologies can help to deliver "development as freedom".

Lying so far at the margins of thought is the possibility of "Development 2.0": the idea that ICTs might have the potential to usher in a new paradigm for development. We can, for sure, see the outlines of this:
• Disintermediation of traditional development actors; for example, in Kiva's work to deliver financial flows direct from individual Western donors to Southern entrepreneurs.[67]
• Intermediation of new development actors; for example, the growing role of mobile phone operators in mediating the fiscal relations between African governments and their citizens.[68]
• New business models that move beyond market vs. state; for example, IT social outsourcing that sub-contracts IT work to social enterprises in poor communities for developmental purposes.[69]
• New models of group working for development and new roles for the poor as digital producers; seen, for example, in the growing numbers of participatory video and community radio initiatives already mentioned above.

Many of these are related to new network-based processes and structures for "doing development". Identifying and articulating these, and their potential as a new "Development 2.0" paradigm, is a potential key project for ICT4D 2.0.

Integrating Perspectives
We may conclude that each one of the three intellectual domains – computer science, information systems, development studies – has something to offer the ICT4D field.

Conceptually, this means we need spaces that bring these three domains together. That has not yet been achieved, and it remains the key intellectual challenge during ICT4D 2.0. But there are some promising possibilities in groupings such as the ICTD conferences[70], which get a mix of informatics professionals to address development issues, and in the recently-formed IFIP special interest group on Interaction Design and International Development. Both groupings focus those at the computer science/information systems boundary on the particular needs and practices of system design in a development context. They draw on the broader burgeoning fields of design-for-development in the academic sphere, and design-for-emerging-markets in the commercial sphere.

Practically, this means that ICT4D 2.0 projects need a combination of the three areas of expertise if they are to succeed. That could be interpreted as meaning multi-disciplinary teams. But just as important will be the issue of leadership. Here, we can extend the general finding that successful IT projects are led by hybrids who span the technical and the organisational.[71]

Figure 4: Creating ICT4D 2.0 Champions

Computer
Science

Information
Systems

*ICT4D
Champions*

Development
Studies
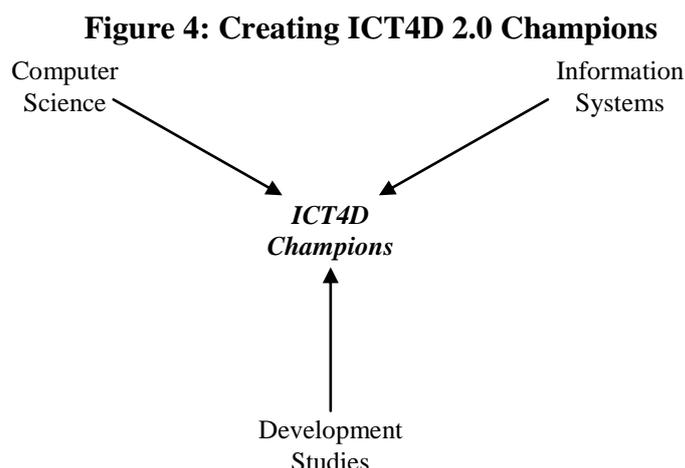
As summarised in Figure 4, we therefore need to develop or find ICT4D champions who are "tribrids". They must understand enough about the three domains of computer science, information systems, and development studies to draw key lessons and to interact with and manage domain professionals. How these tribrid ICT4D champions are created is another question. Vocational training will no doubt help; something that those creating Masters programmes in ICT4D are keenly aware of. The author also observes that tribrids tend to self-create during ICT4D projects as leaders from any individual domain rapidly find themselves facing problems that only insights from the other domains can solve.

Teaching ICT4D 2.0

There is a small, but growing, number of formal training programmes dealing with ICT4D.

The one-year MSc in ICTs for Development at the University of Manchester[72] explicitly uses the Figure 4 model as the basis for its training foundation. The experience has been that many participants already have a good foundation of Computer Science skills, so these are provided only as an option.

The focus of the core curriculum is therefore on three areas:
- Development concepts: foundational frameworks of knowledge for understanding development processes and structures.
- Development project practice: knowledge and skills related to managing projects in a development setting.
- Information systems: knowledge and skills for understanding information and information systems, and their construction and implementation within development settings.

The curriculum also links the different domains through a capstone element on ICTs and socio-economic development, and a set of field visits to ICT4D projects in a developing country. In teaching this element, this – and other ICT4D curricula – have often structured themselves around the ability to achieve MDG-like goals (with issues such as economic growth added). A question for ICT4D 2.0 remains whether this "integrated approach" (see below) is most appropriate, or whether there is a place for a more transformational "Development 2.0" curriculum.

Strategically, it means that we also need to develop tribrids in ICT4D policy- and programme-making. We can chart this requirement by tracing a chronology of views about ICTs and development, as shown in Figure 5.

Figure 5: Changing Strategic Views on ICTs and Development
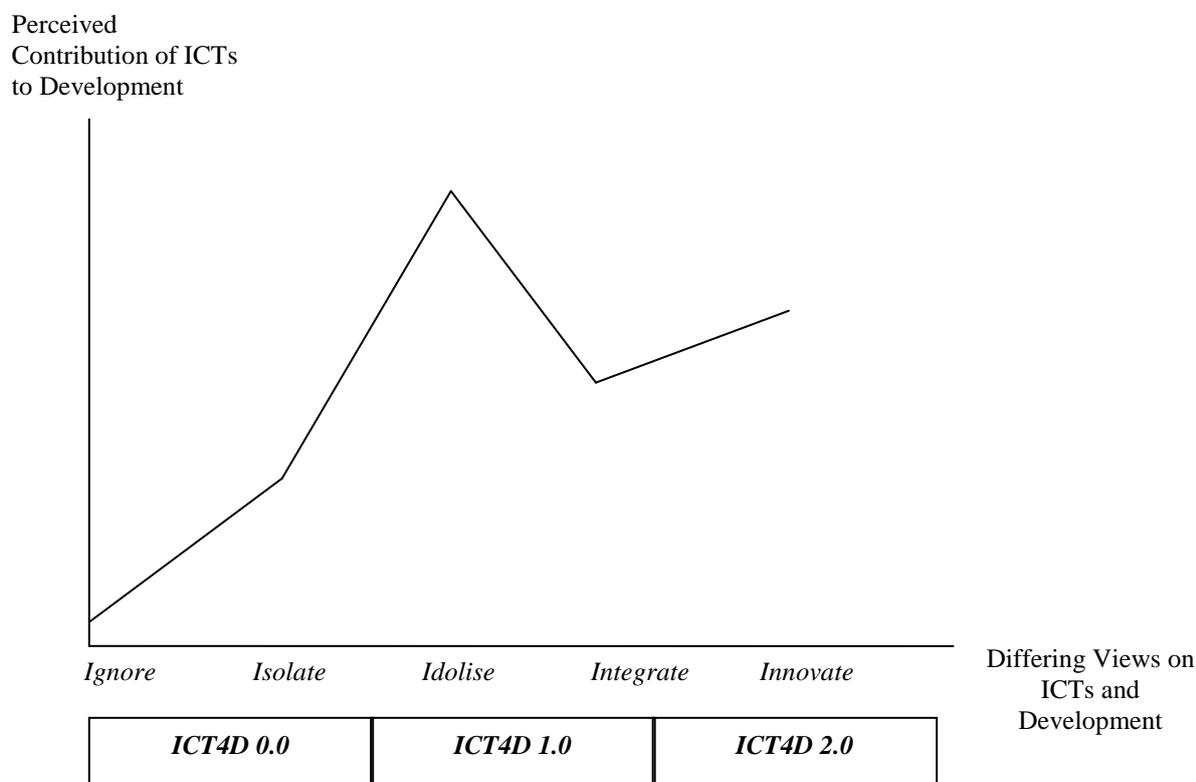
We can use this to reinterpret our earlier chronology of technology and development. Until the 1990s – what we labelled ICT4D 0.0 – most development programme- and policy-makers tended to either ignore IT (as it then was) completely, or to isolate it away from the mainstream of development into separate policies and ministries. Even if technology overall was seen positively within the development studies paradigms which dominated thinking, IT was relegated to a more marginal role, or even seen negatively (as, for example, in the "Jobs not Computers" graffiti appearing in India during the 1980s).

As just indicated, this was a view that continued among at least some development officials during the 1990s as part of a more general side-lining of science and technology. But, at the same time, and driven from a technical and computer science-based paradigm that initially touched little on development studies, the ICT4D movement arose. This idolised digital technologies and placed them centre-stage in the development process. The world's main problem came to be seen as the digital divide: lack of access to ICTs.

ICT4D 1.0's failure to live up to its hype has already been charted. The latter part of this phase saw what might be called a reassertion of the supremacy of development studies, which has drawn also from information systems views on what they see as the overly-narrow conceptions of computer science. ICT thus came to be "mainstreamed"

within development, meaning it became subservient to the achievement of development goals, integrated into a long list of other tools and techniques that might prove useful. A typical formulation would start with a development goal; then seek to understand the role of information and communication in achieving that goal; then ask which new technologies – if any – could help deliver that role.

In many ways, this integrated approach looks very sensible; it is one that many agencies – the World Bank, Canada's International Development Research Centre, the UK's Department for International Development – are following. It represents where we start with ICT4D 2.0 and it lies behind mantras such as "a means not an end" or "a tool not a goal" that one hears quoted in relation to ICT4D.

ICT Policy: Beyond The Menu

During ICT4D 1.0, a lot of research and advice about ICT policy seemed to focus much more on content rather than process and structure. To use a catering analogy, there has been an excess of attention to the policy menu; a lack of attention to the cooking and the restaurant. To continue the analogy, though, one can take a menu from a Michelin-starred restaurant and give it to the managers of a McDonalds; that does not mean they will be able to produce the required food: they lack the necessary institutional basis and capacities to do so.

In future, the menu will still be important, and it will change: for example in response to the convergence of digital technologies.[73] However, we should also look more at two aspects during ICT4D 2.0. First, institutional capacities and their location. Experiences with various types of ICT policy suggest the value of autonomous and capable state agencies, combined with strong representative bodies for both the private sector and civil society and a mechanism for robust interaction between these three groups.[74]

In addition to these structural considerations, the process of intervention over time is important. A foundation for some positive policy impact appears to be capacity for flexibility, learning and iteration within the institutions of ICT strategic intervention.[75] Put another way, it may be that the starting content for ICT policy is of less importance than imagined; instead, what matters more is the capacity to observe and react to the impacts of policy interventions and the contextual changes that beset the ICT domain.

But the integrated approach is also problematic for a number of reasons. By trapping ICT as a tool serving individual development goal silos, it misses out on ICTs' role as a cross-cutting, linking technology. This reduces the chance of diffusion of learning about ICTs, increasing the danger of reinventing wheels. ICTs can also now fall out of development programmes because they have no overarching champions. As many gender activists will tell you, when an issue becomes "mainstreamed" into development policy, that can be a synonym for "forgotten": "simply mainstreaming ICT4D … does not work"[76].

As described earlier, putting the ICT artefact front-and-centre in development is highly problematic. But it also achieves things that are lost when ICTs become subsumed through integration. A sense of excitement, motivation and hope about development are lost. And the ability to tap into additional development funding sources, such as those of IT sector philanthropists, can also be lost.

An integrated approach typically means an information-centric approach to ICTs, conceiving them as tools for handling the information and communication that

development requires. As a result, it seems harder to recognise and develop ICTs' productive role as the potential basis for thousands of new ICT microenterprises. Finally, the transformative potential of ICTs disappears in an integrated approach. There is no question of Development 2.0: of seeing how ICTs could "move the development goalposts" or of "thinking outside the MDG box".

For an example, we need look no further than the current state of mobiles in development. There are no cross-cutting initiatives to learn about this new mass technology, which is only adventitiously being incorporated into development projects, or to identify its transformative possibilities. Where is the necessary MOTForce – a Mobile Opportunities Task Force to match the earlier DOTForce – without which mobiles' contribution to development will be left to the market, left to chance, or just plain left behind?

Rectifying this during ICT4D 2.0 demands not just project-level tribrids, but policy- and programme-level tribrids. They can provide a more balanced approach to ICT4D strategy; an innovative approach that pulls its plan of action from an amalgam of the key questions each domain can answer:

- What is possible with digital technology? (from computer science)
- What is feasible with digital technology? (from information systems)
- What is desirable with digital technology? (from development studies)

Research Priorities for ICT4D 2.0

Much of the research agenda for ICT4D 2.0 flows from the phase change components outlined here:
- *New technologies*: e.g. more research on mobiles, on FOSS, on broadband, on integrating different ICTs.
- *New applications*: e.g. more research on content creation by poor communities and the potential for Web 2.0; and more research on using ICTs for productive purposes.
- *New innovation models*: more research to understand best practice in collaborative/para-poor innovation, and the realities of facilitating and scaling grassroots/per-poor innovation.
- *New implementation models*: more research on new ways to fund, organise and manage ICT4D.
- *New viewpoints*: more research that makes intellectual connections between development studies and the computer science/information systems boundary area; more research on ICT4D "beyond mainstreaming".

It will include specific elements drawn from other text boxes, such as:
- *Urban development*: researching use of ICTs in the developing world's cities.
- *Climate change*: researching how ICTs can record, publicise, reduce, and help deal with the consequences of climate change in developing countries.
- *Beyond the menu*: researching how ICT4D policy is made and implemented rather than simple reformulations of policy content.

Finally, we can identify some more generic research priorities[77]:
- *Defining development*: researching what vision of development ICTs can facilitate: just the MDGs or more than that? And researching how ICTs redefine development – is there an emerging "development 2.0"?
- *Standing back*: more research that "stands back" in various ways; in terms of time – taking a longitudinal approach; in terms of engagement – taking a more independent and less self-interested view on projects; in terms of focus – taking a more political economy and critical studies perspective that analyses who frames the ICT4D agenda and whose interests are being served.
- *Evaluation*: moving (per Figure 6) from researching ICT4D readiness and availability, to researching uptake and – especially – impact. Rigorous impact assessment is the Macavity of ICT4D – much talked about but hardly ever seen.

G. Conclusion

There is no sharp dividing line to let us say, "ICT4D 1.0 stopped here; ICT4D 2.0 began here". On the ground, there is a sense of evolution, not discontinuity. And yet … something messy, fuzzy but new is emerging. And it makes sense to see what happens if we give this a label and a summary, as shown in Table 1.

Table 1: Summary of ICT4D Phases

Issue / **Phase**	**ICT4D 0.0** (1960s – mid-1990s)	**ICT4D 1.0** (mid-1990s – mid-/late-2000s)	**ICT4D 2.0** (mid-/late-2000s onwards)
Iconic Technology	PC Database	Telecentre	Mobile Phone
Key Application	Data Processing	Content (& Interaction)	Services & Production
The Poor	Who?	Consumers	Innovators & Producers
Key Goal	Organisational Efficiency	MDGs	?Growth & Development?
Key Issue	Technology's Potential	Readiness & Availability	Uptake & Impact
Key Actor	Government	Donors & NGOs	All Sectors
Attitude	Ignore --> Isolate	Idolise --> Integrate	Integrate --> Innovate
Innovation Model	Northern	Pro-Poor --> Para-Poor	Para-Poor --> Per-Poor
Dominant Discipline	Information Systems	Informatics / Development Studies	Tribrid of CS, IS and DS
Development Paradigm	Modernisation	Human Development	?Development 2.0?

What, then, might we argue are the key differences between ICT4D 1.0 and 2.0? In answering this and summarising what was presented above, we could draw parallels with the concept of Web 2.0. For example, ICT4D 2.0 is about the world's "long tail" – using digital technologies to draw on the capacities of the 80% who hold only 20% of the world's resources. Or, using Eric Schmidt's "don't fight the Internet" characterisation, we can see ICT4D 2.0's slogan as "don't fight the poor". Where 1.0 imposed pre-existing designs and expected the poor to adapt to them, 2.0 designs around the specific resources, capacities and demands of the poor. Or, we can transform "the network is the platform" to argue that while ICT4D 1.0 saw ICTs as a tool for development, the second phase sees ICTs as the platform for development.

Alternatively, we could break things down into a chronology of ICT4D issues, as represented in Figure 6:
- *Readiness*: do we have the policies and infrastructure to make ICT availability possible?
- *Availability*: how can we roll-out ICTs to the poor to help them become users?
- *Uptake*: in what ways can we implement and apply ICT to make it useful?
- *Impact*: how can we use ICTs to make the greatest developmental impact?

Figure 6: Changing ICT4D Issues Over Time
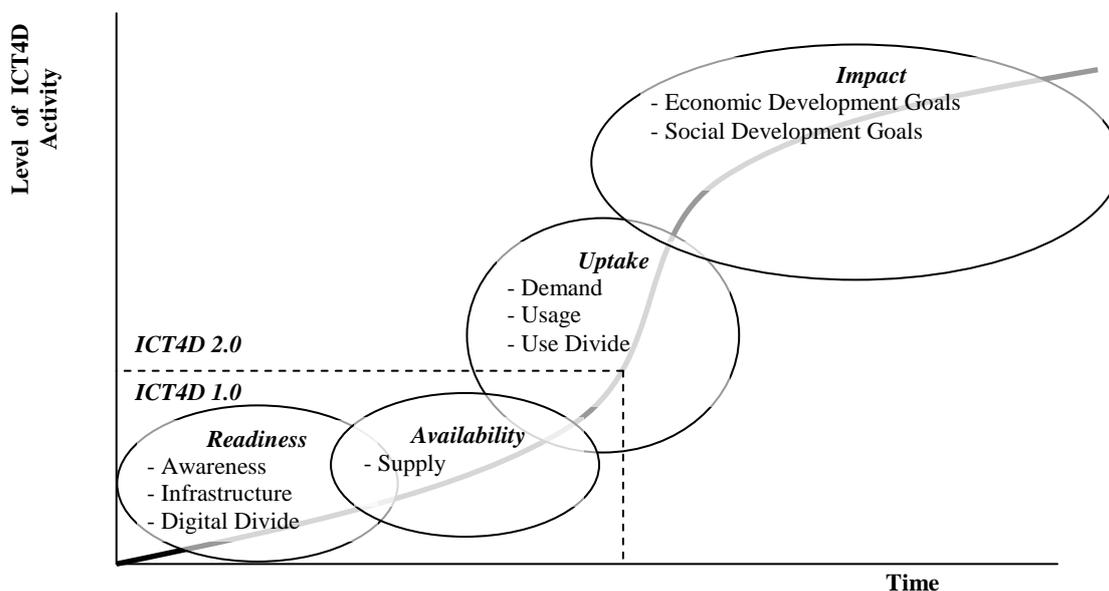
Of course, readiness and availability and uptake issues will remain relevant for at least a generation; indeed, forever as new waves of technology emerge. And they present ongoing needs for innovation in infrastructure, hardware and software. But mobiles are already a reality, and Internet-connected PCs are a growing possibility, particularly for the urban and peri-urban poor. So, where ICT4D 1.0 was about getting the foundations in place, and proof of concept such as piloting largely supply-based uptake, ICT4D 2.0 can turn part of its attention elsewhere.

It can stop thinking solely about pilots, and can instead think more about sustainability, scalability and impact. It can stop thinking from a mono-disciplinary perspective, and can instead think more from a tri-disciplinary perspective that combines computer science, information systems and development studies. And it can stop thinking solely about "needs" – often defined from outside poor communities in rather paternalistic terms. Instead, it can also think about "wants" – what is it that the poor themselves actually demand? How do and would poor communities use digital technologies if left to their own devices?

In conclusion and above all, we can see that ICT4D 2.0 is about reframing the poor. Where ICT4D 1.0 marginalised them, allowing a supply-driven focus, ICT4D 2.0 centralises them, creating a demand-driven focus. Where ICT4D 1.0 – fortified by the "bottom of the pyramid" concept – characterised them largely as passive consumers, ICT4D 2.0 sees the poor as active producers and active innovators. Three overarching questions for this next phase therefore emerge. How can the poor be producers of digital content and services? How can they create new incomes and job through ICTs? And how can we recognise and scale the ICT-based innovations they produce?

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