

HOW DOES ICT WORK FOR DEVELOPMENT? A REVIEW OF THE CHALLENGES AND OPPORTUNITIES

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Abstract:

The paper reviews the current international efforts to harness information and communication technology (ICT) for development. Whereas computers and internet broadband connections have not yet penetrated the African continent to a significant extent for various reasons, mobile phone services, telecentres and business incubators are broadening access to information that is of relevance to local entrepreneurship and social empowerment. The paper argues that it is the 'long-tail' phenomenon that has been created by the internet that is increasing business opportunities for entrepreneurs also in poor developing countries. PCs and broadband connections may eventually follow suit to give more room to local languages and political participation.

Introduction

It is a truism that ICT can support human and economic development. ICT helped the developed world to significantly reduce business transactions costs by providing much wider and cheaper access to relevant information, knowledge, services and means of communication cheaper. There is no indication that the effect on developing countries would be any different. Especially, the use of ICT to get more and faster information on the demand and supply of specific markets is crucial for the competitiveness of small and large enterprises. For developing countries, ICT may offer even more opportunities and make development in general more efficient. [1] The UN showed a clear commitment to realize these opportunities through Goal 8 of the Millennium Development Goals (MDG) that aims to "*develop a global partnership for development*" and, "*in cooperation with the private sector, to make available the benefits of new technologies, especially information and communications technologies*". [2]

The statistical data on ICT use in developing countries is however still meagre [3] and the data available is mainly highlighting the digital divide [4]. This paper will first discuss the evolution information and communication technology for development (ICT4D) [5] (II.) and then examine the status quo of ICT with regard to universal access (III.) and the development of local content (IV.) and finally address the potential of developing countries to take advantage of the emerging long-tail (much wider access to information that is of local or niche group relevance (VI).

The record of foreign investment and aid to developing countries regarding information and communication technology is largely driven by self-interest. Be it individual communication via telephone or mass communications via radio and television broadcasting – private sector investments and western governmental aid would materialize only if profits are in reach or if it contributes to a favourable image in public back home. A comprehensive landline telephone infrastructure for Africa was never build, due i.a. to unattractive investment policies put forward by national governments and the subsequent reluctance of private business to invest. In this context, the rapid rise of mobile phones in Africa is largely a response to the institutional bottlenecks associated with fixed lines.

In face of the big challenges to make ICT work for development, the International Telecommunications Union (ITU) [6] and the former UN-Secretary General Kofi Annan in his so-called challenge to Silicon valley [7] initiated the process leading to the World Summit of the Information Society (WSIS). While the WSIS' multi-stakeholder approach is overbroad it has implications for the present topic.

The second phase [8] of the WSIS was held to find solutions, reach agreements in the fields of Internet governance and arrange for financing mechanisms. The Tunis Agenda translated the eleven key principles identified at the first meeting in Geneva into action lines, three of which are relevant to this paper:

- ⇒ "ICT Infrastructure: an essential foundation for the information society (C2)" aiming at improving access, especially in developing countries, by means of all available technologies.
- ⇒ Creating an "Enabling Environment (C 6)" by making national governments and at the private sector cooperate in various fields, i.a. regarding infrastructure (root server; international domain names) and conducive ICT policies that encourage entrepreneurship, innovation and investment.

"Cultural diversity and identity, linguistic diversity and local content (C8)" is meant to reduce the language-based disadvantages in ICT use in general so as to eventually transpose the world's cultural diversity onto the internet.

Prior to the WSIS, numerous NGO and private sector initiatives in the field of ICT4D had already been in place. They might also coincide with or complement one or more of the three action lines.

The Tunis Agenda invites UN agencies and other inter-governmental organizations to facilitate activities among

different stakeholders, including civil society and the business sector, to help national governments in their implementation efforts. [9] The ITU is expected to support infrastructural activities (C2). The different facets of the enabling environment fall in the shared competence of ITU, UNDP, UN regional commissions and UNCTAD, while UNESCO is the facilitator when it comes to diversity issues and local content.

At the WSIS follow-up inaugural Internet Governance Forum (IGF) of November 2006 in Athens "Internet Governance for Development", entire sessions were devoted to the issues of universal access and diversity, however without any resolve to facilitate real action.[10]

In 2006 the Global Alliance for ICT and Development (GAID), the successor of the United Nations ICT Task Force [11], a global multi-stakeholder forum was created to enhance the ICT-based achievement of internationally agreed development goals, notably reduction of poverty. While the IGF is a forum for discussion, dialogue and policy development, the GAID is funding specific projects. The GAID is funded by a Trust Fund to which voluntary contributions can be made.

Whether the different stakeholders working in the field of ICT4D will be better off under the umbrella of the IGF remains to be seen. It is doubtful whether the coordination function of the IGF will actually be able to accelerate the penetration of ICT in developing countries, and Africa in particular.

The first and foremost condition for development via ICT – be it for the creation of or the mere reception of content – is access. As of today a little more than one billion people on the globe have internet access. [12] Consequently the remaining majority is not able to use the blessings of internet applications – stretching from e-mail, e-commerce to e-learning and much more.

Universal access is not a theme confined to the subject of ICT. It was used with regard to other resources such as education, health services or satellite slots. In the seventies satellite technology played an important role in information and entertainment business, a technology which almost only first world countries could afford. While the rich north demanded to allow for the free flow of information, poor countries feared a cultural colonisation if they did not receive the financial help needed to complement the western media programmes with content of their own. [13] The good news is that scarcity of frequencies is not an issue with regard to the Internet and Internet access is more affordable than satellite slots. However there are multiple cost-intensive conditions for the economic and cultural potential of the Internet to become accessible for people in developing countries.

Internet access includes very different things such as access to electricity [14], a dial-up, wireless or landline broadband internet connection, as well as the necessary hardware and software. [15] Universal access as it is advocated by the Working Group on Internet Governance (WGIG) [16] has three components: availability, accessibility and affordability. Further requirements for

internet access are peering and interconnection agreements [17] and spectrum policy. [18] We will look at the types of internet connection and receiving devices in more detail as they are elements where entrepreneurs may be able – depending on the circumstances – to actually choose from different possible solutions, in spite of the fact electricity supply and the conclusion of peering agreements may be beyond their reach.

1. Access to the Internet

Only about 6 of 100 individuals have access to the internet. [19] The ways of accessing the internet are manifold. A first distinction can be made between fixed lines (coaxial cable, fiber optic or copper wires) and wireless access.

1.1 Fixed Line Option

The fixed lines encompass telephone cable and glass fibre cable which can be used for broadband access. Glass fibre is superior when it comes to transporting high bandwidth over long distances. [20] In view of poor telecommunications infrastructure and broadband access, the most typical form of access in developing countries are still dial up via telephone cables, using a type of modem. The inconveniences of this model are obvious, considering that in rural areas the telephone is often a scarce resource which is needed for outgoing and incoming urgent telephone calls of an entire community. Glass fibre is expensive due to labour costs. These costs are however lower in developing countries. [21] Consequently it seems very unlikely that the existing fixed landline infrastructure will remain the premiere and exclusive strategy for securing internet access up to the last mile. Fixed landlines will be the technology for connecting cities, while smaller communities will eventually have to rely on wireless access.

1.2 Wireless Access Option

The other component of access is thus wireless technology. Due to its ability to cover wide geographic areas (max. 70sqm) efficiently, it is beginning to provide the most efficient solution for innovative and high-speed broadband services to consumers in remote and underserved areas. There are different technologies for wireless internet *broadband* access. The most well known are WiMAX (Worldwide Interoperability for Microwave Access), WiFi as well as satellite [WiBro](#), [UMTS-TDD](#), [HSDPA](#) and [Satellite](#).

WiMAX is best described as a standards-based technology enabling the delivery of last mile wireless broadband access as an alternative to cable and DSL (Digital Subscriber Line). It is especially a viable alternative where broadband access has been economically unavailable. [22] While WiMAX may offer a high bit rate (70 Mbit/s) over a long distance (up to 70 miles) under ideal circumstances, in urban environments it is likely that users may only receive 10Mbit/s over 2km. With WiMAX one can either have high bandwidth or long reach, but not both simultaneously. The other feature to consider with Wi-

MAX is that available bandwidth is shared between users in a given radio sector, so if there are many active users in a single sector, each will get reduced bandwidth. The technology is thus very suitable to low density environments and easily installed via an antenna on a roof top which might serve about 1000 users. [23]

WiFi is a brand name originally licensed by the Wi-Fi Alliance to describe the underlying technology of [wireless local area networks \(WLAN\)](#). WiFi technology operates in an unregulated band of radio spectrum designated 802.11. This is an unlicensed band of spectrum that is shared and available for use by anyone. Up to now it was most commonly used for personal appliances, such as a microwave oven or a cordless home phone, and for specialized purposes such as the radar "gun" used by law enforcement to read the speed of a moving vehicle. A typical Wi-Fi setup contains one or more wired access points and one or more clients using wireless devices. WiFi is becoming popular in large cities allowing wireless internet access for free on park benches or in train stations. Costs for a ten square mile WiFi network "cloud" amount approximately US\$ 150,000 or more – a fraction of the price for wired broadband access. Smaller "clouds" are a lot cheaper. [24]

The other options for wireless Internet broadband access, e.g. access via satellite, constitute for the time being no suitable alternative for access in developing countries mostly because of the high costs [25] involved for access and/or devices.

1.3 Achievements and Obstacles

There hasn't been a real breakthrough yet and the ICT situation regarding broadband access in rural areas of developing countries is very much unchanged.

As mentioned above one of the central institutions for ICT4D after the WSIS is the Global Alliance for ICT and Development (GAID) [26]. One of its flagship projects, "Broadband for Africa", funded by the World Bank and other organisations involves three interrelated elements:

The first step is the completion of sub-marine cable that is to surround the African continent. [27] The final piece from South Africa to Sudan called the 'East Africa Submarine Cable System' (EASSy), should be completed by the end of 2007 and connect up to 20 points on the African coastline which should serve as basis for connections to locations inside the continent. It is originally an initiative of "New Partnership for Africa's Development (NEPAD)". [28]

In a second phase, the Regional Communications Infrastructure Project (RCIP) will be based on the coastline access points created by EASSy and connect Kenya, Burundi and Madagascar via fixed land lines. Not all East African states, however, are committed to the EASSy-project as African newspaper reports suggest. [29] Kenya for example has voted instead for a solution where first 'The East African Marine Systems' (TEAMS)

will be in charge of connecting Kenya with Fujairah in the Gulf of Oman via Mombasa [30] and, second, India's Reliance Communications got a contract to connect Kenya, Mozambique, South Africa, Tanzania, Madagascar and Mauritius via a submarine and land cable. [31] Afterwards, it is planned to connect Zambia, Botswana, Ethiopia, Djibouti, Malawi, Uganda, Ruanda, Lesotho, Zimbabwe and Somalia.

Already the responsible multi-stakeholder group within WGIG in 2005 came to the conclusion that the primary governance mechanism for telecommunications networks is through national governments. [32] While some infrastructures are privately owned, they often happen to be the monopolistic successor to a former government agency, or duopolies [33] having to fear only weak competition. Therefore the WGIG suggested that the national regulator should secure the equal distribution of resources through mechanisms such as universal agreements and the encouragement of investment. [34] This lesson is further evidenced by the SAT3 experience: This submarine cable connects African countries on the western coast to the Internet. The conditions for access did not considerably improve because the services do not reach institutions and individuals in developing countries as prices for broadband internet access in many SAT3-connected countries have remained prohibitive. [35] National governments need to liberalise the telecommunication markets and to allow price reducing competition. [36] Unfortunately, the experts on the pertinent IGF panel on access complained – again – that the staggering number of those having access especially in developing countries is still due to national monopolies over infrastructure in the local loop and lacking competition. [37]

A similar threat faces wireless access. A couple of African governments are considering to levy or have already implemented so called licensing fees for the creation of hotspots or the use of the radio spectrum [38] in order to compensate losses expected in the event of increasing broadband usage. Such license fees will i.a. raise prices for consumers and reduce the leverage this technology could have for universal broadband access.

As far as access via mobile devices is concerned, the content available, e.g. over Wireless Application Protocol (WAP) additional costs through licensing regimes or taxes might become obstacles to widespread adoption [39]. The mobile segment of the telecommunications sector in Africa has however been subject to more liberalisation. [40]

2. Receiving devices

In developing countries, the availability of devices that may be connected to the Internet is still below a ratio of 5 for 100 individuals. [41] Even though there are today about 20 times as many PCs than 17 years ago, the predominant increase of PC in urban areas as opposed to rural areas must be taken into account. [42] Even in agglomerations an SME using ICT may do that only in one of the many Internet Cafés. There are currently two main

strategies on how to raise the number of devices able to connect to the Internet in developing countries.

2.1 Cheap PCs

One strategy is to produce and distribute cheap computers that are adapted to the typical environment of users in developing countries. The best known initiative carries the ambitious name of "One Laptop per Child" or "XO-Children Machine" and was launched in January 2005. [43] The laptop has been designed by a team around Nicholas Negroponte, formerly Professor of the Massachusetts Institute of Technology (MIT), and the cost of its production amounts to about 100 U.S.\$. Solid and colourful, it provides for nearly all common uses and runs only open source software. Millions of these laptops are expected to go into production late in 2007, with Thailand, Brazil, Uruguay and Rwanda, among others, signed up for the launch.[44] Over a wireless local network the laptop will connect to a school server containing educational material. Internet access will depend on whether cable or wireless access is available.

A similar product, a Linux-based desktop for 150 \$, is ready for sale by a Chinese firm called YellowSheepRiver Municator.[45] In contrast to the MIT laptop it is not primarily aimed at children, but at all kinds of people that need an affordable computer. It will primarily be sold in the rural area of western China as well as Southeast Asia. [46] A list of other low-budget hardware products has been published by the Information for Development Program [47] of the World Bank.

2.2 Mobile Phones

The second strategy tries to benefit from the much higher adoption rate of mobile phones in developing countries compared to any other ICT-device. In Africa, less than 15 % of the population own a mobile phone [48], but it is still the most prevalent ICT device.[49] At the Consumer Electronics Show in February 2006, Microsoft showed off a prototype of a "Cellular PC" that used a TV screen as a display and a keyboard for input. Both peripherals would be connected to the phone via special adapters. According to Microsoft, cell phones make more sense as a basis for inexpensive computers: they are common, relatively cheap, and the infrastructure exists for their usage already.

Fortunately even less sophisticated telephones have become a viable alternative to Microsoft's cellular PC and PCs in general. Entrepreneurs already access to the internet via their mobile phones. Mobiles of the second generation are able to use Internet services via the General Packet Radio Service (GPRS) or Enhanced Data rates for GSM Evolution (EDGE) standard. Third generation mobiles will be able to benefit from the much faster Universal Mobile Telecommunications System (UMTS) or the High-Speed Downlink Packet Access (HSDPA) standards. The coverage of these standards in developing countries is continuously being expanded. [50] Even if the mobile

phone user misses the broadband experience, the form of access is sufficient for many development furthering forms of information and communication.

2.3 Advantages and Drawbacks of both solutions

The 100\$ laptop initiative leaves many questions open: Why is the project primarily designed for educational use and not for business purposes? How will the machine be integrated in a local primary school curriculum? One may wonder, whether a PC is the essential tool for providing better education to children in developing countries, where classrooms and qualified teachers may be *the* lacking resource. In reality the 100\$ laptops will certainly be used by whole families for different, even business purposes and thereby benefit larger communities beyond the initiative's intentions.

There are of course a couple of problems with Microsoft's idea as well. First it may require an external display. Although TVs are an obvious choice for an inexpensive external display, they are not terribly common in a lot of the places where the 100\$ laptops will be distributed. In addition, a TV's is not adapted to being used as a monitor.[51] The second issue is that a Microsoft product is likely to run Windows/Vista as an operating system, which is very uncommon for mobile phones and would put them well out of the reach of the MIT program's budget.[52] Up to now there is as regards affordability a lack of alternatives to cheap PCs such as the 100\$ Laptop with its multiple possible applications. [53]

If however the mobile is not expected to replace a PC with high speed internet access and premium content on a big screen, mobile technology is very attractive from a business point of view. Even if GPRS and EDGE telecommunications providers still charge downloading content by kilobytes [54], leading to extraordinary prices for very little information and even if with GPRS and EDGE voice traffic is given priority over internet traffic thus extremely slowing down transmission: mobile telephony is mobile, is more common, more familiar and less demanding with respect to literacy and language skills. [55] The initial investment in infrastructure for users and providers is lower and prices for telephones as well as telecom services are continually going down. [56] The mobile therefore is currently *the* ICT device for the rural poor that don't have access to internet cafés.

3. Interim Findings

The central results of this section can be summarised as follows:

⇒ Internet broadband access is or will be shortly available and in coastal areas even accessible to the general public. However access is in many places

not affordable, due to monopolist pricing of network owners or license fees on running a wireless network. National regulations in the telecommunication sector especially with regard to the fixed line segment are the core obstacle in making the internet broadband access broadly accessible. Commitments in telecommunications services were first made during the Uruguay Round (1986-1994), mostly in value-added services. In extended negotiations thereafter (1994-1997), Members negotiated on basic telecommunications services in the Negotiating Group on Basic Telecommunications. [57] Since then, new commitments have been made either by new Members, upon accession, or in a unilateral fashion by an existing Member. The Doha Round has so far not produced any significant results. African countries have not committed themselves to significant liberalization as the unilateral reforms of their markets took place after the negotiations. [58] WTO-members are often afraid that foreign providers will successfully compete in the profitable sectors of the market, while they will not assume the role of a universal service provider.

- ⇒ Broadband access is not a primary concern as long as people at large cannot afford devices able to connect to broadband.
- ⇒ It is possible to lower the costs for PCs. In many instances they are subsidised or donated for a specific purpose which limits their entrepreneurial use. Moreover they rely on fixed lines or wireless access points for internet access which are not affordable for the broad majority.
- ⇒ Internet access via a mobile phone to a limited type of applications is already a possibility for those who own one. However the price for the data downloaded is still unaffordable for many. This option is currently being pushed by interested investors and governmental and international institutions. [59] Because of the high mobile penetration and the familiarity with the technology access by mobile phones is the most promising technology even if users will not enjoy all attractive applications of the internet. As the WiMAX standard will spread at least in agglomerations broadband access there could become a lot cheaper and faster, especially if mobiles supporting WiMAX become available.

4 Prerequisites for Local Content Creation

In order for ICT to become a tool for development it is important, but not sufficient to supply the necessary technology. The internet is adopted [60] by people only if it also contains locally relevant information. [61] Even if a lot of useful global content is available on the Internet, content related to their daily needs is what users are most interested in.

4.1 What is local content and do developing countries need it?

What is local content? [62] This question triggers very different answers depending on who is being asked and where the person lives. For the inhabitant of a first world agglomeration it may be the opening hours of local shops and museums, dates for waste disposal, bus schedules and availability of certain goods, stock exchange news, information on local public construction works and national as well as local political debate, satire, job offerings in the area etc. In many developing countries up to date local content may not yet be in place. It is however from an entrepreneurial point of view easy to imagine that reliable local business news on the availability of goods and services as well as quality and prices in countries where transportation is rather longsome will save enormous amounts of time and/or money. In rural areas where up-to-date newspapers are rare or inexistent or do just not contain the relevant information, checking on market sales prices, job offerings, and new local goods and services opens new opportunities.

4.2 Technical equipment

Local content will be created by local people. The creation of content requires better technical equipment than just a mobile phone. With regard to this aspect the connection to internet broadband access and the availability of PCs mentioned above are therefore indispensable. In response to this need, the follow-up institutions of the WSIS, namely the aforementioned GAID coordinate a second flagship project named Telecentre 2.0. [63] The aim of the project is to move beyond simply providing access but also include e-learning, training and skills development, local content generation, financial services, e-government and others services relevant to the local community. Partners rallying under the GAID/telecentre.org banner [64] will work in four areas:

- 1) building telecentre networks;
- 2) developing content and services;
- 3) documenting knowledge and learning; and
- 4) convening events for telecentre leaders.

Until 2010, 100.000 telecentres in at least 20 countries should be functioning. Visits to telecenters have however been below expectations in several countries. [65]

4.3 Languages

Another issue often mentioned in connection with local content is the availability of local languages as means of communications. Information and its reception depend to a high degree on language. Even if looking for sounds or images, basic knowledge of the internet's site's language or at least its script is highly desirable. [66] About 72% of the WWW pages are in English, twelve privileged languages account for 98% of all webpages. [67] A further obstacle for people mainly from less developed countries to receive and add information is thus apparently the language. [68] While

learning one of the dominant languages is certainly a giant step forward, it is being argued convincingly that processing information and knowledge – also on ICT – is best accomplished in one's native language. [69] To create local content in underprivileged languages requires however sweeping and very expensive measures: Creating [70] the linguistic resources [71], elaboration of an internet terminology, elaboration of the necessary resources such as a the system of script [72] and a spelling and their representation on the computer, mapping the symbols into a digital table [73], establishment of standardized fonts of characters, hardware manufacturing (especially keyboards) and software development etc. This Sisyphus work [74], while certainly a desideratum for political discourse on the internet, it is not prerequisite for applying ICT as a tool for development.

It may be true that ICT usage and the non-conformity of devices to the linguistic needs have an impact on the local language or the use of the local script [75], it should be noted however that with regard to receiving and imparting entrepreneurially relevant information via mobile phones fluency and literacy in English or another dominant language is not a must. The ICT language and script applied can therefore not be considered a relevant factor as long as the focus lies on the purely entrepreneurial use of internet content available via mobiles. [76] If ICT is to be used in an educational context, languages become more of an issue. [77]

5 What are the current entrepreneurial opportunities?

ICT is a tool that can be used for wide range of development enhancing purposes. The applications as everywhere else range from e-government, to medical support and various types of counselling related to education and e-commerce. The following paragraphs demonstrate three different types of ICT related entrepreneurship.

5.1. Providing access to ICT

While the numbers of devices that can connect to the internet are steadily on the rise, many individuals are unable to afford devices and telecommunications services on a permanent basis. Entrepreneurs have therefore taken to enabling access via PCs in internet cafés or kiosks as well as at public PCs in rural areas and offering airtime on mobile handsets a profitable business.

Internet cafés are a frequent business in large cities; they are open 24 hrs and sell the seats before the screen by the hour. [78] This obvious business model has its precursors in, legally speaking, renting telephones, fax machines or other devices which not everybody can afford. Development aid projects have adopted the model and donated public PCs or mobile handsets that can be used for setting up a business. The GSM Association's Development Fund supports i.a. within the Shared Voice Project, the supply of mobile handsets to entrepreneurs that sublet them to third persons. [79]

The internet and its applications partially replace older sets of communication and information gathering, but also offer totally new forms of usage. While owners of fax machines will have less clients and people search the internet instead of library catalogues for useful information, many people will do things via internet and other ICT applications, which they have never done before. An example may be to search on the internet for the local supply and demand of certain products and services and, depending on the price, participate in the bidding process. This helps reducing transaction costs and increase opportunities for entrepreneurs.

The business of providing access to ICT has thus not just shifted from one technology to another. The sector in general is growing as more and more locally relevant information becomes available over the internet and people become aware that it is an extremely useful resource for them.

At least in more densely populated areas internet cafés on the one hand and renting out a mobile telephone on the other hand, must each be considered as competing services. However the often uniform pricing for either broadband internet access via PC or mobile phone access to WAP-content [80], gives not much leeway to local providers of access devices when it comes to pricing. Intermediaries as local access providers are therefore an ephemeral phenomenon and will vanish as soon as more and more people themselves own devices and are able to afford internet access.

5.2 ICT as enhancing traditional business

One of the more durable models for enhancing entrepreneurship through ICT is to integrate it in operations of traditional business.

When mobile telephones are introduced in low-income economies, two main types of effects occur. The first is that the cost and time of collecting information to support economic decisions are reduced. [81] The result is quantitative and qualitative – an individual can make more transactions in a given time thereby reducing transaction cost, and each decision is based on better and increased availability of affordable global and local information. In both cases, value is added. The other effect is the network effect. As the number of users in a communication network increases, the number of possible connections increases with the square of the number of users. This effect accelerates the creation of value added. [82]

In addition to that a traditional business with ICT support may see the barriers to entry lowered and be able to uncover new sources of revenue.

5.2.1 Production of and Trade in Goods and the 'Long Tail'

While it is technologically conceivable to integrate in the traditional production (automated irrigation, textile industry), such sophisticated ICT applications are capital-intensive and thus rarely used to upgrade labor-intensive

industrial processes in developing countries. The main use of ICT in traditional business may be in the field of optimizing communication and information availability on the relevant markets.

A first example for this is TradeNet [83] which went into operation in early 2007. The site which is also accessible via mobiles offers a platform for farmers and traders in agriculture where they can place an advertisement on what they want to buy or sell, including price per unity, amount available, quality modes of delivery and payment as well as a contact. The platform allows farmers and traders to find the economically most advantageous deal and eliminate or reduce the role of intermediaries in the value chain. Perishable goods may be more likely to find a buyer in time than the traditional systems of established trading partners and places. As a consequence of real-time information on where to sell perishable goods, the palette of goods sold might actually be adapted. More access to information about actual market prices also increases transparency and makes farmers less vulnerable to intermediary traders that take advantage of asymmetric information about prices.

A second ICT application has been created for traditionally working fishermen in Senegal. The platform which is also accessible to mobiles is part of an aid project which has been supported by the U.S.-based Information for Development Program (infoDev) and carried out by an NGO called Manobi [84]. Via the platform fishermen can firstly see in real time which types of fish currently sell best and direct their work accordingly; they secondly receive a weather forecast and thirdly can send an alert in case of emergency at sea. While the service was available for free it now costs a minor fee.

Those applications can be considered a tentative manifestation of the so-called 'Long Tail' thesis [85]. This thesis holds that more and more widely available information, knowledge as well as content, products and services can be selected by the user from a wider variety of choices than with traditional ways of communication, and enables niche consumers to self-select. [86] In those sectors where inventory storage and distribution costs are insignificant, it becomes economically viable to sell otherwise relatively unpopular products and services; however, when storage and distribution costs are high, only the most popular products can be sold. For audiovisual media the result is that instead of only 'blockbuster' content being viewed, with choice constrained by the advertising budgets of major TV networks or film studios, the internet companies that make 'Long Tail' of creative content available allow consumers to bypass the gatekeepers (TV networks) and directly tapped the pool according to their particular preference. Hence P2P networks which began by trading large volumes of popular music tracks increasingly trade smaller volumes of niche music, some of which becomes popular through such trading. Popular bands are starting to emerge due largely to their presence on the Internet, without the need of initial filtering and marketing by a music company.

With regard to agricultural products the tail may not be as long. Substitutes to basic foodstuff are not as numerous as music products, storage may be costly and there may be fewer niches type products. But still – farmers and traders in agricultural products experience an incredible increase in choice in where to buy in which quality. It will become easier for producers and distributors in all kinds of sectors to assess the actual demand of customers – be it among developing countries or in the North. There are countless niches that were never served, containing each an opportunity for someone to build a micro-business. A micro-business has then also the opportunity to do cheap marketing for its products via a website that displays the products on sale. However, actual delivery will then be another challenge if orders come from beyond the immediate local environment. Setting up a website is however still very costly and only well endowed firms with an export business may be able to afford such a marketing channel and the moment. Regarding mobile telephone access the first platform, BangO [87], where enterprises can do marketing has recently gone into business with prices beyond what many SMEs from developed countries could afford.

The new opportunities may however also destroy existing buyer-seller relationships which will possibly be replaced by relationships where ICT is used on both sides. However consumption and trading in general will be enhanced if earlier separate markets begin to interact. A question mark however is whether the physical delivery of corporal goods will function satisfactorily since means of transportation have not become ICT enhanced. A different issue are products that can be delivered in digitised form, such as software, music, brochures which will be treated below.

5.2.2 Services

The third example refers to banking. [88] Internet and especially mobile phones are an excellent way to introduce banking. Several companies offer so-called M (obile)-Banking which makes banking available to many new clients. In early 2006, the mobile phone became the first communications technology to have more users in developing countries than in developed ones. WIZZIT is a start-up mobile banking provider [89] that offers a banking account accessible via mobile phone and debit card and without charge for initial registration. Physical contact with the bank is only necessary to set in savings. Customers can use their mobile phone to make person-to-person payments, transfer money, purchase prepaid electricity, and buy airtime for a prepaid mobile phone subscription. The banks earn upon transactions fees only, which vary from bank to bank.

M-banking not only allows individuals to manage the few resources they have in a safe way, it also enhances local entrepreneurship since money can be transferred without risks. Especially loan repayments and utilities payments [90] can be made regularly without necessitating a displacement on the part of the customer. In cases where the bank collaborates with telecommunications

providers, loans [91] to SME may become less risky for banks and thus more frequent as they can always threaten to cut off the mobile.

5.3. Building new ICT based business models

The most promising type of ICT enhanced entrepreneurship is the one that uses ICT not only as tool for communication and information gathering, but actually creates tools and other digitised products and services. The most common examples are music, videos, and software supplied over the net, and services such as stock broking or financial or medical advice, home page design, back-office work for banks and insurance companies. With qualified human resources in place such enterprises in developing countries have tremendous potential for offering competitive global services. Yet, such type of enterprise heavily relies on broadband internet access and PCs and this may still be bottleneck in efforts to offer these services in poor developing countries.

The need of broadband connection for ICT based business is being taken into account by the so-called business incubators which have been funded by the World Bank. Such incubators exist in several African countries and bundle office space, internet broadband connection, as well as legal and financial counselling and make it available to promising ICT based SMEs. The tenants of an incubator project in Mozambique offer services that range from juridical services online, an national search engine, web development services, an online sport magazine, the tourism portal of Mozambique and an enterprise for "Mobile" education.[92]

TradeNet is also a typical example of an ICT based business model. It relies on the first three years on public funding, but should then be able to sustain itself. The platform will offer advertisement space for free offers, but if contacts are made, users will be asked to pay a fee.[93] If it became more affordable to promote enterprises via mobile phones to design this would also be an interesting field of business.

5.5. Interim Findings

The examples show that existing traditional business can be greatly enhanced thanks to ICT even at the present level of their development. It has to be noted however, that a mainly mobile phone based form of ICT fails to connect to the global internet for reasons of mobile capacity and affordability. Most entrepreneurs will continue to operate at a local or regional level even if their products could be sold in developed countries because they remain invisible on the internet.

The chance for even small entrepreneurs in developing countries provided by the 'Long Tail' will be to identify and serve niche-audiences with niche products and services on a world market for traditional and local goods, innovations and services. Craftsmen could also take to produce tailor-made products on demand for a price

premium. To locate demand for a niche product on the world markets requires the entrepreneur to browse the internet, something which can't be done by mobile phones. The availability and affordability of PC-based broadband internet access is therefore desirable if the full potential of the 'Long Tail' shall be realised.

Conclusion

Keeping in mind that ICT is certainly not the only tool for development, the WSIS analysis of the ICT-situation in developing countries remains valid: Universal broadband internet access is not yet realized and local content of developing countries is underrepresented on the internet. The paper shows however that thanks to contributions of different stakeholders the lacunae identified by the WSIS are being addressed.

Different initiatives have been undertaken with regard to affordable broadband access, via landlines or the mobile phones. The Kenyan example shows that an internationally led top-down initiative as the GAID within the EAssy is not always welcome. The use of physical infrastructure and frequencies is unfortunately often subject to a licensing regime. In the more liberalised markets of mobile telephony revenues are being taxed. The success of the initiatives depends therefore mainly on individual national governments to create a competitive business environment, where access becomes an affordable option to any average citizen. The WTO Doha Development Round could bring momentum as the partial unilateral telecommunications market liberalisation, which has taken place after Uruguay could be translated into commitments. The persisting conflict over agricultural products keeps WTO-Members from making commitments in that area. [94] It is therefore not in the near future that broadband may come to everyone's doorstep. The latter is true for PCs which are still too costly and would rely on the often deficient broadband access.

As far as providing access via mobile or PC are concerned and the ICT support of traditional business ICT even at this early stage must be regarded as a strong language-neutral tool for enabling entrepreneurship. The local or regional trade platforms that feature real time economic data, accessible via mobile phones constitute a giant step forward for entrepreneurs as does the widely available M-banking. They might be considered a tentative application of the 'Long Tail' thesis.

ICT-based business still relies to a large extent on a high standard of technical equipment and therefore requires often private or public funding as in the case of Business Incubators. Realising the full potential of the 'Long Tail' will also require an increase in PCs and affordable internet broadband access. If entrepreneurs from developing countries conceive not just the global web-community but also the slowly emerging local web-communities in the neighborhood as their possible consumers, at least minimal knowledge of one of the dominating languages as well as increased investment in ICT user relevant education may also become necessary.

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6. Resolution 73 of the International Telecommunication Union (ITU) taken in Minneapolis in 1998, <http://www.itu.int/council/wsis/R73.html>, resolved to instruct the ITU Secretary-General to place the question of the holding of a WSIS on the now called United Nations System Chief Executive Board - CEB and to report to the ITU on the results of that consultation. It was decided that the Summit would be held under the high patronage of the UN Secretary-General, with ITU taking the lead role in preparations.
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8. The first phase took place in Geneva in December 2003; the second phase in Tunis Conference was held in November 2005.
9. Tunis Agenda for the Information Society, WSIS-05/TUNIS/DOC/6(Rev.1)-E, of November 18, 2005. 10. para. 103
10. The IGF is the Tunis (2005) compromise on the institution in charge of internet governance. While the U.S. wanted to keep the pre-2005 status, many southern countries supported a UN administration of the Internet, the root servers and the naming system which lies with the U.S. based ICANN (Internet Corporation on Assigned Names and Numbers).
11. <http://www.unicttaskforce.org/>.
12. See the numbers presented at the IGF in November 2006: Regarding broadband 60 % of Europeans and Americans have access, 40 % in Asia and 0,1% of Africans, <http://www.intgovforum.org/IGF-Panel5-0111106.txt>, (visited 9.3.2007).
13. Menghetti, E. (1992) Die völkerrechtliche Stellung des internationalen Satellitenfernsehens im Spannungsfeld von Völkerverständigung und Propaganda, Zürich, 185 ff.
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- (visited 27.3.2007). The designers of MIT's 100\$ laptop had this problem in mind when they equipped it with a hand crank. The Chinese product equally consumes very little power. Another way to free users from unreliable power supply are commercially available solar powered PCs, even if at high prices, see <https://www.solarpc.com/catalog/>, (visited 27.03.2007). Other than device-connected solar power requires still too costly and pose the problem of storing energy, see Wikipedia, http://en.wikipedia.org/wiki/Solar_power (visited 31.3.2007).
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- As peering agreements rely on a "critical mass" of customers of each of the contracting ISP it is difficult to imagine how African ISP should be able to gain this critical weight if prices remain high and new customers cannot be won easily. IXP-Construction is needed to reduce the cost for inner African or South American traffic.
18. Wireless access via WiMax, WiFi or GPRS relies on spectrum policies, management and availability. The subject has therefore been on the agenda of international organisations. Unfortunately the developing countries which could profit the most of this affordable technology are only insufficiently represented in standard setting bodies such as a professional organisation called Institute of Electrical and Electronics Engineers, Inc. (IEEE).
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 20. Tongja, R. (2005) 95.
 21. Id..
 22. <http://en.wikipedia.org/wiki/WiMAX>.
 23. V. Haarhoff (2006) Uganda gets WiMax network, ITWEB, June 1, 2006, <http://www.itweb.co.za/sections/telecoms/2006/0606011040.asp?A=SME&S=SME&O=FPIN>, (visited 3.7.2007).
 24. Levy, A. (2003) Creating Affordable Universal Internet Access, TechKnowLogia, January - March 2003, http://www.techknowlogia.org/TKL_active_pages2/CurrentArticles/main.asp?IssueNumber=19&FileType=HTML&ArticleID=475.
 25. On satellite access see, R. Tongja (2005), 93.

26. It is a multi-stakeholder cross-sectoral platform and forum that brings together all stakeholders representing relevant constituencies such as governments - development cooperation, foreign policy, finance, social, sectoral (health, education) and regulatory agencies; in the private sector - industry and workers associations, producers and consumers of ICT, the media; in civil society, NGOs, foundations, scientific, academic and ICT communities and individuals providing advocacy and oversight on Information Society issues and implementing programs addressing MDGs.
27. The western side of Africa is connected via SAT3. To give it its full name, SAT3/WASC/SAFE Consortium is an international fibre that goes from Portugal to South Africa and out across the Indian Ocean to Asia. The cable system is divided into two sub-systems, SAT3/WASC in the Atlantic Ocean and SAFE in the Indian Ocean. The combined length of the SAT3/WASC/SAFE system segments measures 28 800km. It has 36 members who put up US\$600-million to build and operate it for the life of the cable over the next 25 years. Of the African continent it connects Senegal, Côte d'Ivoire, Ghana, Benin, Nigeria, Cameroon, Gabon, Angola and South Africa. As the members of the Consortium are monopolists in their countries and liberalisation slow broadband access is still expensive in certain areas; see BBC New: Warning over African internet cable, March 15, 2006, <http://news.bbc.co.uk/2/hi/africa/4787422.stm> (visited 7.3.2007). Unconnected countries such as Namibia have trouble getting access, Jensen M. (2006) Open Access: Lowering the Cost of Bandwidth in Africa, Association for Progressive Communications (APC), 8, APC Issue Papers Series 2006, APC-200610-CIPP-I-EN-PDF-0027.
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73. The Unicode standard assigns a unique number to each character used in the written languages of the world. The storage of these numbers in text processing comprises another topic; problems result from the fact that much software written in the Western world deals with 8-bit or lower character encodings only, with Unicode support added only slowly in recent years. Consequently, the fact that a character has been encoded by UNICODE standard does not mean working with it becomes directly possible. On its homepage Unicode provides a list of Unicode enabled products, www.unicode.org/onlinedat/products.html, (visited 31.3.2007).
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