



**ICT POLICY DIVISION
GLOBAL INFORMATION AND COMMUNICATIONS DEPARTMENT (GICT)**

**THE ROLE OF MOBILE PHONES IN
SUSTAINABLE RURAL POVERTY REDUCTION**

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1 Introduction

1.1 Abstract & Overview

Many developing country governments and developing agencies are focusing on extending telecommunications services into rural areas, as they seek to alleviate poverty, encourage economic and social growth, and overcome a perceived ‘digital divide’. However, relatively little is known about how rural communities benefit from modern telecommunications services and what impact it is having on their lives and livelihoods. This paper endeavors to redress the balance, by examining the role of mobile telephones in sustainable poverty reduction among the rural poor.

In the first section, we ask three questions: (a) Why are the rural poor important?; (b) What is information and why is it important?; and (c) Is the mobile telephone the most appropriate delivery mechanism for that information? In the second section, we look at the current status of the mobile industry in both the developed and developing world: (a) we consider the ‘explosive’ growth in availability and affordability of mobile phone services, which has been high in the developed world, but is gaining speed in the developing world; and (b) we examine the role of the private sector in this impressive growth. In the third section, we drill down into the impact of mobile telephony. We begin by examining the perceived correlation between GDP per capita and mobile penetration. Then we turn our attention to the examination of channels through which mobile phones benefit the rural poor: (a) direct benefits; (b) indirect benefits; and (c) intangible benefits, which contains an overview of hard-to-measure, rarely discussed but relevant, benefits of mobile telephony: namely, disaster relief, dissemination of locally-generated and locally-relevant educational and health information, and social capital or social cohesion. In the fourth section, we review several emerging global trends that may change the use and impact of mobile telephony in rural areas. Finally, the fifth section summarizes and interprets the main conclusions.

1.2 Why the Rural Poor?

Three of every four poor people in developing countries live in rural areas, i.e., 2.1 billion living on less than \$2 a day and 880 million on less than \$1 a day.¹ Thus, any comprehensive poverty reduction strategy has to address rural poverty. This paper makes the argument that it is important to include ICTs for the rural poor into these strategies due to the potential impact ICTs can make on their lives and livelihoods.

Arguably, the *value* of mobile phone services and the associated benefits are higher in rural areas. One benefit, which we will be discussing later in the paper, is substitution for transport. Although the rural poor are not a homogenous group – consisting of artisans, farmers, fishermen, herders, migrant workers, and indigenous people – one common element is their lack of affordable access to relevant information and knowledge services. This lack of access can lead to other contributors to poverty (e.g., ignorance of income-earning or market opportunities and inability to make their voices heard).

¹ World Development Report 2008: Agriculture for Development, The World Bank, 2007

1.3 Why Information?

The lack of affordable access to relevant information and knowledge services among the rural poor has been a concern to development economists for some time. Traditionally, information is regarded by economists as a critical element in the efficient functioning of markets. For example, the first fundamental theorem of welfare economics (i.e., competitive equilibria are Pareto efficient) and the law of one price (i.e., the price of a good should not differ between any two markets by more than the transport cost between them) are based on the assumption that economic agents have the necessary information (Jensen 2007). Moreover, access to information is essential for the emergence of global information and knowledge based economy and has the ability to empower poor communities, enhance skills, and link various institutions involved in poverty reduction. Despite this being widely recognized, access to information has been limited in reality and very few empirical studies exist which assess the impact of investments aimed at providing access to information.

Despite the increasing rural demand for relevant and timely information and market knowledge and recent advances in information and communication technologies (i.e., their declining costs and increasing speed, efficiency and user-friendliness) that opened a wide range of opportunities to meet this demand and to improve the livelihoods of rural poor, the benefits from ICT investments have been unevenly distributed between and within countries resulting in what has become to be widely known as the *digital divide* and *information poverty*. Most of the beneficiaries of the ICT revolution have been those with resources and skills leaving out the majority of the rural poor. There are several underlying causes for this situation, which fall under the following broad categories:

- (a) Institutional Environment Constraints: The enabling policy and regulatory environment is often not conducive to stimulation of competition and increased private sector involvement in the provision of ICT infrastructure and services to rural communities. Typically, there is also a lack of well-developed and functioning institutional mechanisms to implement the policies and regulation; lack of locally relevant easy to understand content in local language; and lack of well-trained human resources to develop applications and service the end-users.
- (b) Rural Infrastructure Constraints: Rural ICT infrastructure is often underdeveloped, due to the high costs of last mile connectivity in rural areas, intermittent and unreliable power, and low priority for ICT investment, due to other more pressing needs in the rural sector.
- (c) Rural Population Constraints: The characteristics of the rural population themselves are not conducive to ICT absorption. Barriers include: low population density and remoteness, low levels of functional literacy, little or no basic or computer literacy, low awareness, low disposable income, poor health and living conditions, and constant struggle for survival.
- (d) Rural Poverty Reduction Strategy Constraints: Finally, ICT is not an area that has been well-integrated in rural poverty reduction strategies: often narrowly defined as modern technologies (e.g., computers & the internet) and the more traditional technologies (e.g., fixed line telephone, radio & television) have not yet themselves been fully exploited.

1.4 Why Mobile Telephony?

Given the unprecedented growth of affordability and coverage of mobile telephony services and its increasing importance as a means of two way communication, the scope of this paper is limited to the role of mobile telephony in sustainable rural poverty reduction in developing countries. The focus on mobile telephony is further justified by the following facts:

- (a) Affordability (Demand-Side): The many pricing models offer affordability and choice, even for very low-income customers (cheap handsets, micro prepayments, top-up cards). Innovative ways of mobile phone access, which allow sharing of phones through SIM cards and payments for air time through micro-prepayment, promote even more rapid adoption by the poor;
- (b) Affordability (Supply-Side): Establishing mobile masts is a relatively inexpensive way of serving large & remote rural areas, compared to last mile cable for fixed line telephony.
- (c) Flexibility: It is not pricing models that are flexible: usages are also. Mobiles can be used for text and voice and are two-way communications (i.e., more flexible than radio/TV).
- (d) Low Barriers to Entry: In response to factors above, mobile has become the most easily accessible and ubiquitous communications device in rural areas. Easy availability of low priced new handsets with basic features and emergence of secondary markets for used devices, whose prices are even lower, make them within reach for even the poorest of the poor.

2 Status of the Mobile Telephony Sector

2.1 The Mobile Industry in the Developed World

Mobile phones have become the primary form of telecommunication in both developed and developing countries. Globally, mobile phone networks play the same role that fixed-line phone networks did in facilitating growth in Europe & North America in the 20th century. The industry has experienced explosive growth in a relatively short time span. The first billion mobile phones took around 20 years to sell worldwide. The second billion were sold in four years. The third billion were sold in two years. Coverage has expanded and mobile phone subscriptions in developing countries have increased by over 500% since 2000 (Wireless Intelligence 2007). It is estimated that over 50% of the world's population will own a mobile phone and that 80% of the world's population will live within the range of a cellular network, by the end of 2008. The projections for future performance are similarly impressive to those tracking past performance. By 2010, GSMA projects that 90% of the world will be covered by mobile networks and mobile communication will deliver data, internet and voice services to more than 5 billion people by 2015 – double the number connected today (GSMA, 2007).

In 2002, mobile phone subscribers overtook fixed line subscribers to provide communication services in the world as shown in Figure 1. This was due to the relatively low cost of adding new subscribers to the cellular network (mobiles are much more scalable than fixed-line phones) and the premium placed on mobility.

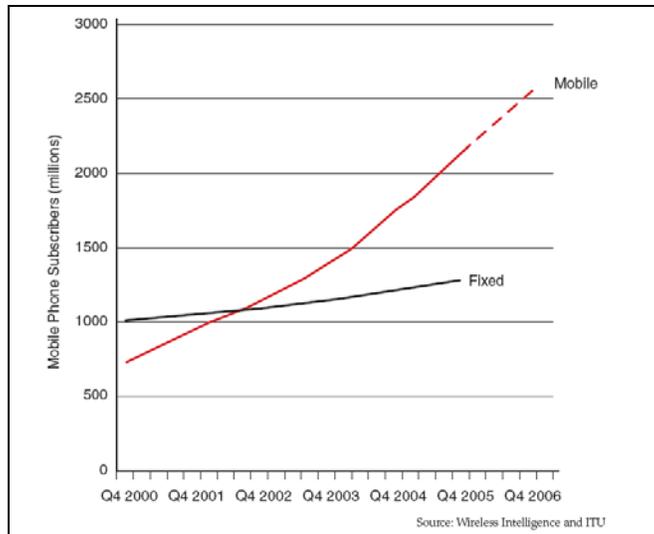


Figure 1: Growth of Worldwide Fixed & Mobile Phone Subscribers (2000-2006)
Source: GSMA 2006

http://www.gsmworld.com/documents/public_policy/regulation/regulation_and_digital_divide_v3.pdf, page 14

The main driver of this explosive growth was and continues to be private sector investment in the mobile phone sector, assisted by a favorable enabling legal and regulatory environment. The private mobile operators provide services which cater to the demand of consumers and generate profits for manufacturers and operators alike. This enables the mobile industry to be a fast-changing one, responsive to advancements in technology and the mounting sophistication of consumer tastes.

Figure 2 lists the Top 13 global mobile phone companies which together have a cumulative base of 789 million subscribers. As the developed world reaches saturation point, major mobile companies have their eye on the next prize – a fast-growing mobile subscription base in the developing world.

Company	Main Technology Used	Number of Subscribers (million)
China Mobile	GSM	158.6
Vodafone	GSM,UMTS	151.8
China Unicom	IS-2000,GSM	100.1
T-Mobile	GSM,UMTS	65.0
Cingular	IS-136,GSM,UMTS	49.1
Orange	GSM,UMTS	49.0
NTT DoCoMo	PDC,FOMA	45.9
Verizon Wireless	IS-2000	42.1
Mobile tele systems	MTS (GSM)	34.22
Vivo	IS-136	26.0
Turkcell	GSM	23.4
Sprint PCS	IS-2000	22.2
MmO2	GSM	21.3

Figure 2: The World's Major Mobile Phone Companies
Source: http://www.funsms.net/largest_mobile_phone_companies.htm

2.2 The Mobile Industry in the Developing World

Studies by the International Telecommunications Union indicate that of the world's mobile subscribers only 33% were in the developed world with the remaining 67% in the developing world at the end of 2006. Similarly to patterns observed in the developed world, the developing world has also experienced explosive growth in terms of mobile phone take-up.

Past Growth: Figure 3 below shows the growth in mobile subscriptions by major world regions for 2001-2005. Growth rates have been the highest in North Africa and the Sub-Saharan Africa region attributable to the very limited usage in earlier years. By 2005, there were approximately 83 million subscribers in Sub-Saharan Africa but in majority of the countries mobile penetration was below 10% reflecting a large and untapped potential for future growth and investment opportunities. In 2005, Stephen Yeo, the Chief Executive of the Centre for Economic Policy Research, spoke of the 'leapfrog effect' that mobile phones had achieved over old technologies in Africa: 'The result is explosive growth: 5000% between 1998-2003'.²

Region	2001	2002	2003	2004	2005
World	31	21	22	24	23
Americas	18	12	25	37	35
Asia Pacific	45	32	26	23	21
Europe	26	14	16	21	20
Middle East	36	30	23	27	33
USA/Canada	16	10	16	19	11
North Africa	64	32	36	49	70
Sub-Saharan Africa	59	48	47	54	49

Figure 3: Annual Growth in Mobile Subscriptions by World Regions (%)
Source: Wireless Intelligence

Present Growth: More recent figures, released this month by Total Telecom,³ indicate still more explosive growth. In the first quarter of this year, the number of mobile phone users in Africa exceeded 280 million and is expected to reach 300 million by June 2008. Consequently, Africa has now surpassed North America in terms of the number of mobile subscribers (277 million subscribers in the US & Canada).⁴ In Asia, mobile telephony has grown rapidly in India, especially during the last three years. Recent data from TRAI⁵ indicates that the number of wireless subscriber has reached 250 million, making India the second largest wireless market in the world: second only to China, with teledensity already surpassing the 25% mark.

Future Growth: Future growth projections are also strong. Currently, China is adding about 6-7 million new subscribers per month, India about 8-9 million and the US about 2-3 million (CITA). Africa's mobile penetration rate is expected to increase from 15.37% in 2005 to 31% by 2011 and the number of Africa's mobile subscribers is expected to grow at a compound average growth rate of 13% between 2007 and 2011.⁶

² BBC News, Mobile Growth 'Fastest in Africa', www.bbc.co.uk (March 9, 2005)

³ Kennighan, Mary, African Mobile Subscribers Reach 280m, *Total Telecom* (May 1, 2008)

⁴ Note this statistic excludes Mexico, which has approximately 65 million mobile subscribers

⁵ Telecom Regulatory Authority of India (TRAI), Government of India, New Delhi, Mar 2008, No 27/2008, www.trai.gov.in/trai/upload/PressReleases/549/pr24mar08no27.pdf

⁶ Bharat Books, African Mobile Market Forecast (2007-2011), Aug 2007

Role of the Private Sector: One contributor to this phenomenal growth has been the involvement of a competitive private sector. From 1995 to 2002, the private sector invested \$210 billion in telecommunication infrastructure in the developing world. In Africa, the majority telecommunication investment has come from the private sector. In 2003, the telecom sector accounted for more than a tenth of gross fixed capital formation in 4 out of the 9 countries covered in ITU analysis (see Figure 4).

Country	Telecommunications Investment in 2003 (\$ million)	% of Gross Fixed Capital Formation
Benin	26.4	5.8
Burkina Faso	34.9	4.5
Kenya	188.6	10.5
Lesotho	7.1	3.3
Mali	17.7	3.0
Senegal	108.6	10.4
Swaziland	27.6	11.7
Togo	30.0	11.5
Uganda	68.0	4.9

Figure 4: Telecoms Investment in Selected Sub-Saharan Countries
Source: International Telecommunications Union (ITU)

The private sector is also active in India and there are a number of telecommunication companies providing mobile telephone services who have to compete for market share and meet consumer expectations. India's major companies and market share are illustrated below in Figure 5.

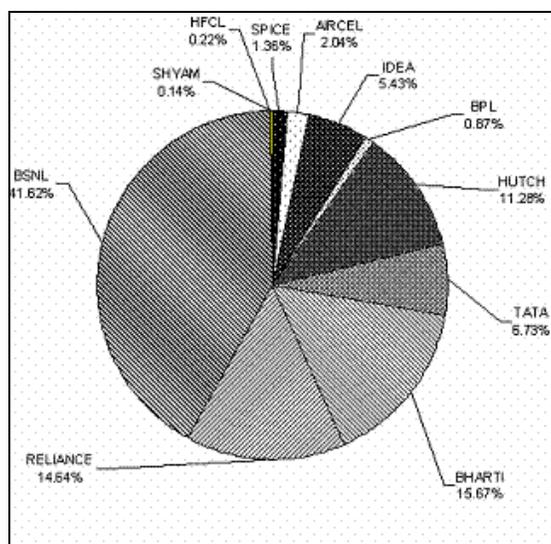


Figure 5: Private Sector Share in Mobile Services in India (%)
Source: Telecom Regulatory Authority of India (TRAI), Government of India, New Delhi

2.3 Different Needs of Developed and Developing World

In concluding Section 2, it is clear that the global market for mobile telephony is substantial. It has been estimated that the annual value of the current mobile market is about \$700 billion and it

is growing at about 10% per year. There are more than 2.5 billion mobile subscribers, representing a global penetration of 40%. The penetration ranges from over 100% in Western Europe to less than 10% in Africa and about 20% in Asia-Pacific (see Figure 6). However, future subscriber growth is expected almost exclusively from developing countries.

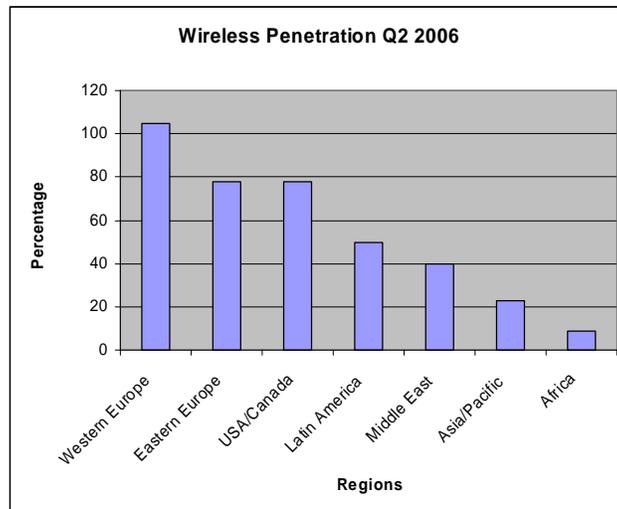


Figure 6: Wireless Penetration by Major Regions of the World
Source: Wireless Intelligence

Therefore, it is important to understand that the drivers of growth in the developed world may differ from the drivers of growth in the developing world. Traditionally, studies have shown that firms in countries with higher levels of income/productivity have higher incentive to invest in efficiency-enhancing ICT than firms in countries with low income levels. A number of factors influence the decision whether or not to invest in ICT. High costs, lack of competition, lack of relevant skills for effective use of ICT could all be inhibitors (Caseli & Coleman, 2001). Studies also show that levels of education are positively correlated with ICT diffusion. Gust and Marquez (2002) found that restrictions in labor/product markets affect levels of ICT investment.

Guerrieri (2003) found that financial conditions and income growth affect the uptake of ICTs. While these factors are relevant for the uptake of ICTs by the rural poor, because of the unique characteristics of the rural populations and rural regions different approaches involving the interventions of the Government and the private sector are needed. Possible interventions could include the public sector taking a role in: (a) creating an enabling environment for competition of service providers; (b) developing the communication infrastructure; (c) developing locally relevant content which meets the needs of the poor, and (d) providing education and training programs in IT enabled services to boost skills and training.

3 Impact of Mobile Telephony

Before we can make policy recommendations concerning the role of mobile phones in sustainable rural poverty reduction, let us consider some of the benefits (or impact) that results from the provision of affordable access to mobile telephony. Although, as we have demonstrated, mobile telecommunications is a substantial driver of economic growth, there are very few in-

depth studies which have been carried out to document the impact of the mobile phones on economic development and on sustainable poverty reduction. This section makes an attempt to bring together a few of the existing impact evaluation studies and draw lessons from these for sustained development.

As we discussed in Section 2, economists traditionally believed that firms in countries with higher levels of income/productivity have higher incentive to invest in efficiency-enhancing ICTs than firms in countries with low income levels, i.e., that there is a strong correlation or linkage between high GDP per capita and mobile telephone penetration (see Figure 7).

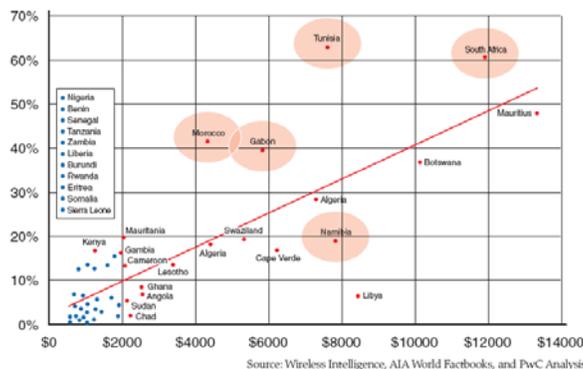


Figure 7: Mobile Telephone Penetration vs Per Capita GDP (PPP) (2005)
Source: AIA Factbook, PwC Analysis, Wireless Intelligence

However, as the above figure illustrates, a number of countries defy this analysis. Three countries performed better than expected – Morocco, Tunisia, South Africa:

- (a) Morocco: Morocco’s GDP is only half that of Namibia and yet its penetration is twice that of Namibia. Upon closer inspection, we see that Morocco exceed expectation due to private sector collaboration and a stable regulatory environment. On the other hand, Namibia suffers from a lack of competition and an uncertain regulatory environment.
- (b) Tunisia: Tunisia has also made remarkable progress: from a low 10% penetration in 2002 to a high 60% penetration in 2005. The success was largely due to the liberalization of the mobile market: mobile licenses were issued for a 15 year period, which included the right to operate an international gateway and duopoly in mobile service provision.
- (c) South Africa: South Africa has a per capita GDP of \$12,000, which is a high income level, but it also has one of the best regulatory environments and penetration at around 60%.

More analysis of the developing world indicates that a low GDP per capita is not necessarily an indication of mobile penetration. In Africa, 8 of the 18 countries analyzed have achieved over 70% population coverage, despite per capita incomes of less than \$1,000 (see Figure 8). The main drivers are: (a) small geographical area; (b) good market conditions; (c) conducive policy environment; and (d) high population density. In Asia, many countries with low per capita incomes have over 90% population coverage (see Figure 9). In Latin America, 8 of the 18 countries analyzed have achieved over 90% population coverage, despite low per capita incomes (see Figure 10).

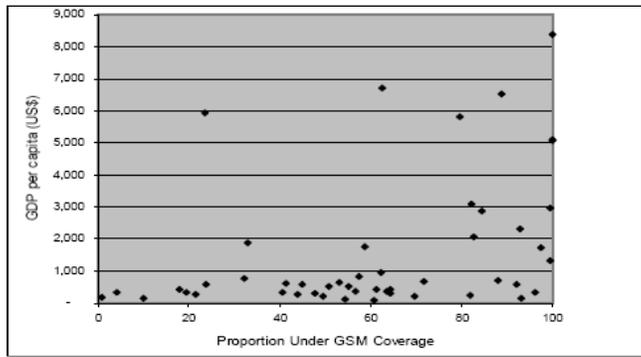


Figure 8: GDP Per Capita vs Mobile Penetration for Africa

Source: Universal Access – how mobile can bring communications to all, GSM Association study conducted by Intelcon Research, 2007, <http://www.gsmworld.com/universalaccess/index.shtml>

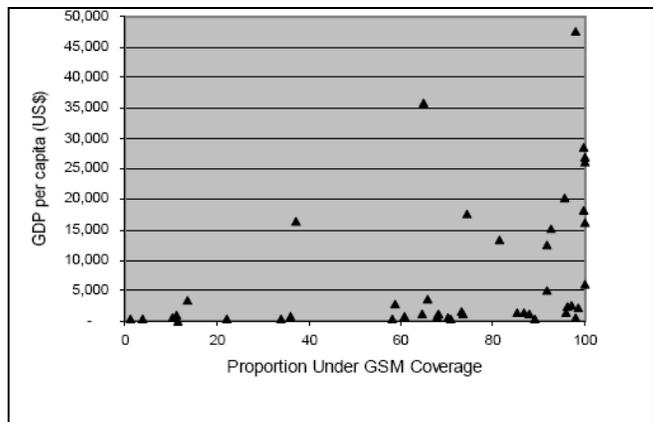


Figure 9: GDP Per Capita vs Mobile Penetration for Asia

Source: Universal Access – how mobile can bring communications to all, GSM Association study conducted by Intelcon Research, 2007, <http://www.gsmworld.com/universalaccess/index.shtml>

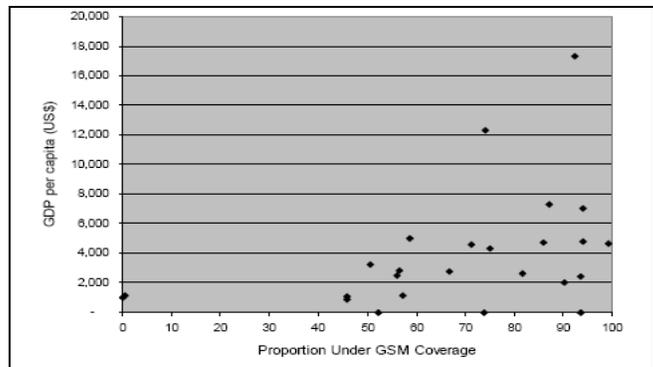


Figure 10: GDP Per Capita vs Mobile Penetration for Latin America

Source: Universal Access – how mobile can bring communications to all, GSM Association study conducted by Intelcon Research, 2007, <http://www.gsmworld.com/universalaccess/index.shtml>

The fact that the correlation between GDP per capita and mobile penetration is not as strong is indicative of two dwindling myths. First, there is the myth that the rural poor are not able or not willing to pay for mobile telecommunication services. Initially, this led to a tendency to invest in the more affluent urban areas rather than poor rural areas but now there are also growing rural

networks in many developing countries. Second, there is the myth that natural barriers, such as lack of education or electricity, would prevent mobile take-up. Strong growth in many developing countries, in spite of still-prevalent difficulties with low education, low access to electricity and low income levels has also gone some way to refuting this theory.

Instead, economists have begun to believe that the **benefits** and **development impact** of mobile telephony outstrip these barriers. (This is not to say that these barriers no longer exist, but rather than developing economies have found ingenious ways around them, given the obvious benefits that the use of mobile telephony can bring, e.g., the lack of electricity in rural areas was believed to be an insurmountable barrier to mobile take-up. However, rural communities developed various ways to adapt to this obstacle: (a) collecting several mobiles from one community and heading to another village to charge them, as at an Issuana mission in Tanzania; (b) using car batteries to charge mobile phones.)

The evidence indicates that the benefits outweigh the constraints. Yet what are these benefits? We have divided our subsequent analysis of the benefits of mobile telephony into three categories: (a) direct benefits; (b) indirect benefits; and (d) intangible benefits (e.g., disaster relief, local content, low education, social capital and cohesion.). The case is built on evidence drawn from a series of policy papers, investigating the development impact of mobile telephony, produced by Vodafone (Mar 2005), Ovum (Apr 2006), McKinsey (Feb 2007) and Deloitte (Jan 2008). The papers build on one another, but categorize the benefits within one of the following dichotomies: economic & social, macro & micro, tangible & intangible.

3.1 Direct Benefits: The Economic or Macro-Level Case

Mobile telephony has a positive impact on the economic welfare in the following direct ways: (a) by generating GDP; (b) by job generation (both in the mobile industry and the wider economy); (c) productivity increases; and (d) taxation revenue (mobile operators are usually a sizeable contributor).

3.1.1 GDP Growth

Let us first examine the evidence that the use of mobile phones boosts overall GDP. Vodafone (2005) reported that, in a typical developing country, an increase of 10 mobile phones per 100 people boosts GDP growth by 6%. Ovum (2006) reported that the mobile services industry contributed Rs 313 (\$7.8 billion) towards GDP in India. McKinsey (2007) estimated the contribution of mobile operators and mobile-related companies and reported that, in China mobile-related companies contributed twice as much to GDP, as mobile operators. Deloitte (2008) reported that, in all 6 countries analyzed (Bangladesh, Malaysia, Pakistan, Serbia, Thailand, and Ukraine) mobile phones had a significant impact on GDP.

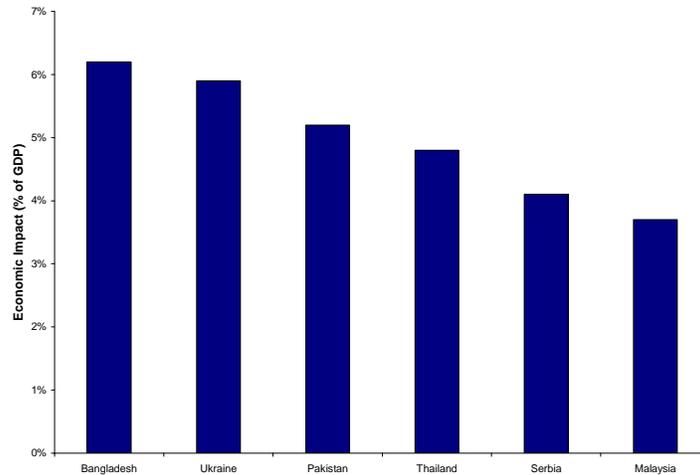


Figure 11: Economic Impact of the Mobile Communications Sector as a % of total GDP (2007)
 Source: Deloitte, Economic Impact of Mobile in Bangladesh, Malaysia, Thailand, Pakistan, Serbia, and Ukraine

3.1.2 Job Creation

Another economic impact is the employment generation of the mobile telephony sector. Ovum (2006) found that the mobile telephony industry created about 3.6 million jobs in India, directly and indirectly. This figure is expected to increase by 30% per year. Deloitte (2008) found that, in the 6 countries analyzed, mobile sector employment in 2007 was significant, ranging from 244,000 FTEs⁷ in Pakistan to 36,000 FTEs in Serbia (see Figure 12). Although the mobile operators themselves only create limited employment, jobs they do create are highly paid and sought after, and there is a major knock-on effect in retail (through the sale of airtime, handsets, and SIM cards).

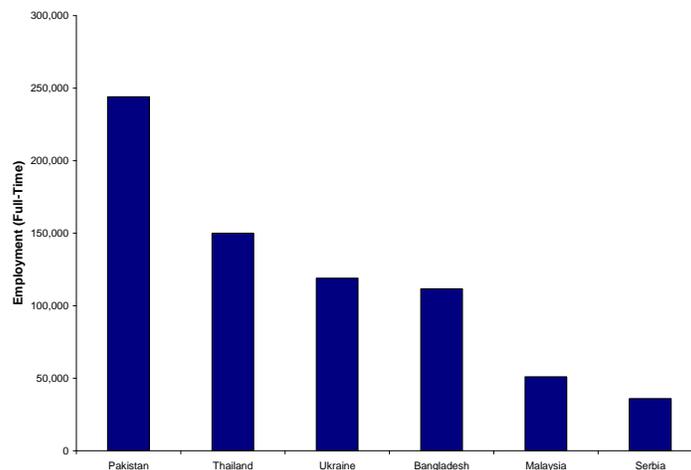


Figure 12: Contribution to Employment from the Mobile Value Chain
 Source: Deloitte, Economic Impact of Mobile in Bangladesh, Malaysia, Thailand, Pakistan, Serbia, and Ukraine

⁷ FTEs = Full Time Equivalents

3.1.3 Productivity

Productivity gains from the operation of mobile telephony can also be substantial. This is analyzed through a range of factors, e.g., the number of workers reliant on a mobile phone and the revenue or time savings that access to a mobile phone (instead of fixed line) may bring. Deloitte (2008) categorized the productivity benefits of mobile phones into five broad areas:

- (a) Business Expansion: e.g., in the import/export & small trade business at Odessa Seaport, Ukraine, mobiles were a powerful tool to estimate demand and seek out new customers
- (b) Employment Search: This is particularly important in countries such as Serbia, which has high unemployment (20%) or Thailand, with its high level of temporary employment
- (c) Entrepreneurialism: Mobile phones reduce the cost of operating and starting up businesses. For example, beauticians in Pakistan, prostitutes in Serbia and taxi drivers in Thailand
- (d) Mobile Banking: Mobile phones reduce the need to meet face-to-face to conduct business. For example, Wizzit in South Africa offers the option of total substitution of banking.
- (e) Transaction Costs: Improvements in the information flows between buyers and sellers, allow for the exchange of information without traveling (we shall explore more later on).

3.1.4 Tax Revenue

In addition to the impact on GDP, there is also a benefit of direct taxation revenue. Ovum (2006) reported that the mobile telephony sector contributed Rs 145 billion (\$3.6 billion) per year in import duties, licence fees, spectrum fees, and taxation revenues in India. Deloitte (2008) estimated the overall taxation revenue, by segmenting the benefit into taxation revenue from the mobile operators themselves, their supplier chain, and other industry retailers – and additional economic impact, dubbed ‘the multiplier effect’. They found that in all 6 countries analyzed, the direct tax contributions from the mobile operators outweighed those from indirect players, as government directly captured revenue from the operations of those companies. On average, mobile operators contributed 26% of total revenues in taxes. This rose to 29% when regulatory fees were included though this varied considerably (see Figure 13).

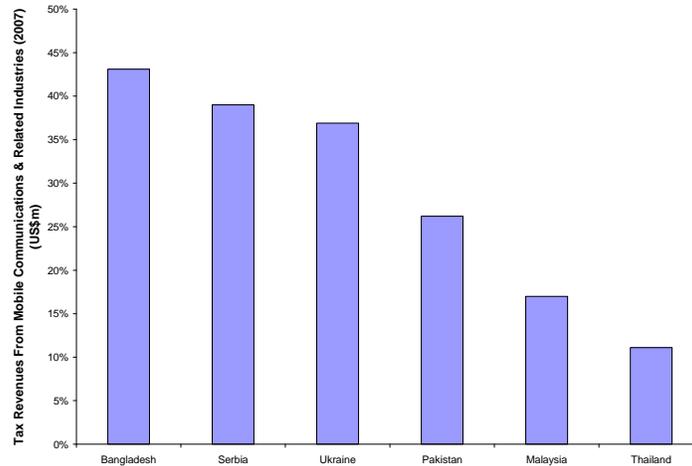


Figure 13: Tax Revenues from Mobile Communications & Related Industries (2007) (\$ million)
 Source: Deloitte, *Economic Impact of Mobile in Bangladesh, Malaysia, Thailand, Pakistan, Serbia, and Ukraine*

3.1.5 Value-Add from Mobile Operator

It is worth pointing out that there are some direct economic benefits from the mobile operator themselves in terms of contract costs, dividends, employee benefits, and wages. Deloitte (2008) conducted some analysis on Telenor, determining five categories of direct value-add from the mobile operator. These were: (a) contractor costs; (b) corporate social responsibility; (c) dividends; (d) regulatory and spectrum fees; and (e) wages and employee benefits. Whilst they are outside the scope of this analysis, it is worth noting they supplement direct taxation revenue.

3.2 Indirect Benefit: The Social or Micro-Level Case

In addition to revenue generation, the use of a mobile phone can itself produce follow-on economic and social benefit, e.g., enhance entrepreneurship, reduce information asymmetries and market inefficiencies and substitute transportation (resulting in another knock-on effect).

A recent economic study carried out by World Resources Institute (WRI) and the International Finance Corporation (IFC); (WRI, IFC, 2007) entitled *The Next Four Billion*, to determine how poor people living in developing countries spent their money found that even very poor families were buying cell phones and airtime, usually in the form of prepaid cards. Another finding was that as their family's income grew - from \$1 per day to \$4, for example - their spending on ICT increased faster than spending in any other category, including education, health, and housing.

Due to the intangible nature of some of the benefits, these factors are difficult to monetize. Deloitte (2008) used the consumer's willingness to pay and 'consumer surplus' as proxies to estimate the market value placed on such factors. Additionally, for each benefit, we have supplied an evidence-based case study, which helps to illustrate the impact of mobile phones at the micro level, in reducing poverty: for example, reducing market inefficiencies in Bangladesh or information asymmetries in India.

3.2.1 Entrepreneurship and Job Search

Mobiles reduce the cost of running a business - and may even enable a user to start one. In China, Chipchase (2006) reported on the case of the live-in housekeeper, who was more or less an indentured servant until she got a cell phone, so new customers could call for her services – or the porter who spent his days hanging around outside of construction sites and department stores and hoping to be hired to carry other people’s loads, but now can go only where the jobs are. In Pakistan, many women have been able to start small businesses for the provision of beauty and hairdressing services, without the need to incur costs of setting up beauty salons. In Thailand, taxi passengers can share the cost of hiring a cab and the mobile is being used to agree time shares.

Overall, Chipchase and other researchers provided anecdotal evidence to support the theory that the use of a mobile phone is an invaluable enabler of entrepreneurship and job search – not to mention the social benefits on the side. Over several years, his research team has spoken to: day laborers, farmers, prostitutes, rickshaw drivers, shopkeepers and ‘all of them say more or less the same thing: their income gets a big boost when they have access to a mobile’. In the case study below, we can also see how even ownership of a mobile phone can itself be leveraged as a form of entrepreneurship: there are many examples of end users using the mobile phone: (a) for m-banking applications; (b) to make payments; and (c) transfer resources to family back home.

3.2.2 Information Asymmetry

The use of mobile phones may reduce information asymmetries, enabling users to access arbitrage, market or trade opportunities that they otherwise would have missed out on. Jensen (2007) in a recent study of fishermen in the Kerala state in India has shown that the use of mobile phones by fishermen in Kerala to arbitrage over price information from potential buyers and coordinate sales has helped them to increase incomes and reduce wastage. Since the use of mobile phones in 1997, there has been noticeable impact on reduction in price variation (mean coefficient of variation declined from 60-70% to 15%), which ensured price stability for the consumer and a nearly perfect spatial arbitrage replaced a collection of autarkic fishing markets.

The survey of 300 sardine fishing units was conducted every Tuesday, from September 3, 1996 to May 29, 2001. Data on: amount of fish caught; costs of operation; sale conditions (market, price, quantity, time, etc.); weather conditions and whether they used a mobile phone were obtained. The survey found that phones were bought by the largest boats first as they could get the largest possible arbitrage gains and could afford the \$100 phones. This study concluded that the use of mobile phones: (a) increased consumer surplus (by an average of 6%); (b) increased the fishermen’s profits (by an average of 8%); (c) reduced price dispersion (by a decline of 4%) and reduced waste (which was averaging 5-8% of daily catch, before the use of mobile phones).

Another study carried out by Jonas Myhr on ‘livelihood changes enabled by mobile phone’ in Tanzania demonstrated that increased access to information through the use of mobile phones by fishermen in Tanzania resulted in empowering them through increased bargaining power, knowledge about market opportunities. There were little or no negative effects (Myhr 2006).

3.2.3 *Market Inefficiencies*

The use of mobile phones can also correct other market inefficiencies or rather supply market efficiencies to redress the balance. For example, affordable access to information is a way of correcting this market inefficiency. The Palliathya help line in Bangladesh⁸ is a successful example in this area. Palliathya uses mobile phones to both increase access to information on the part of men and women living in Bangladesh's rural areas, as well as to stimulate economic opportunities for underprivileged women. The pilot phase offered help-line services to those living in 4 villages of Bagerhat, Jhenaidah, Magura and Nilpahamari districts in Bangladesh using a mobile phone based model.

The helpline services would: (a) prevent exploitation by middlemen; (b) provide employment opportunities (particularly for rural women); (c) reduce information gaps; (d) save cost and time; (e) strengthen access of service providers to rural people. This initiative uses face-to-face contact, together with ICT, to empower women economically, as well as to share community-relevant information on: education, emergency situations, markets, weather, etc. The Palliathya case shows that lack of relevant and timely information was a major bottleneck to rural development. Overall, both these cases demonstrate the importance of the role of information for the functioning of markets and that well-functioning markets have a positive impact on welfare.

3.2.4 *Transport Substitution*

One interesting side-effect of the use of mobiles is the reduction of transportation costs: household expenditure drops and consumer surplus increases. As our previous two case studies have demonstrated, improvements in the information flows between buyers and sellers allow for the efficient trading of information without the traveling. This is particularly significant in rural areas, where traders would have needed to travel to urban areas to check for demand and negotiate on price, this business is now conducted on the mobile. Traders are able to ensure demand exists for their products, before setting out on a journey. Moreover, in certain circumstances, mobile phones can allow the 'middle man' to be cut out.

Two often-overlapping sub-groups benefit the most here: itinerant workers and rural workers. Itinerant workers were surveyed by the McKinsey study (McKinsey 2007), which surveyed 600 workers in China, who traveled for their jobs (e.g. plumbers, salespeople and taxi drivers). McKinsey found that mobile phones offered itinerant workers time savings of 6% - a productivity gain worth some \$33 billion in 2005. Rural workers were surveyed by Samuel, Shah and Hadingham (Samuel 2005),⁹ who found that 56% of businesses in South Africa identified reduced travel as a beneficial impact of the mobile phone, as opposed to just 10% of businesses in Egypt. This was attributed to the 'predominance of rural firms in the South African sample'.

Consumer Surplus: McKinsey 2007 then further developed this idea of transportation savings, by arguing that part of the value of these gains went to the operators as service fees, but that the

⁸ The initiative was named winner of 2005 Gender and ICT Awards: <http://www.comminit.com/en/node/132155/36>

⁹ Samuel, Jonathan, Niraj Shah & Wenona Hadingham, Mobile Communications in Egypt, South Africa & Tanzania: Results from Business & Community Surveys, *Vodafone Policy Paper Series No 3* (Mar 2005)

end user held the remainder as their ‘consumer surplus’. The theory of consumer surplus takes the average revenue per user (ARPU) - at the time the mobile phone is purchased - and assumes that it does not change over time, i.e. it is used as fixed proxy for the value the end user places on his/her mobile phone. By subtracting contemporary ARPU figures from historical ARPU figures (because, as subscriber levels increase, ARPU falls), the value ‘returned’ to the end user and presumably re-injected into the economy as a whole, represents a so-called ‘consumer surplus’.

The value of this consumer surplus can be considerable: in 2005, it was \$37 billion for China and \$4 billion for both India and the Philippines. (These figures are approximate and conservative, because they do not take into account advances in the coverage and quality of the network.)

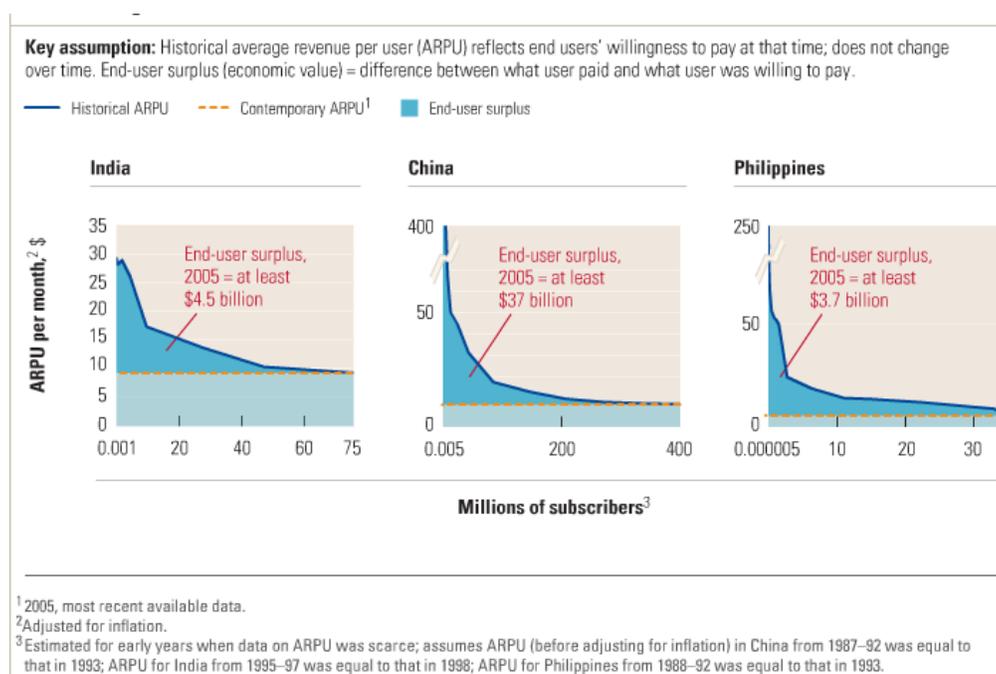


Figure 14: Calculating Consumer Surplus to the End User
 Source: McKinsey, *The True Value of Mobile Phones to Developing Markets* (2007)

3.3 Intangible Benefits

So far, we have discussed four types of indirect benefit of the mobile phones: its value in terms of facilitating entrepreneurship, reducing information asymmetries and market inefficiencies and substituting transportation. In the final section of analysis on the benefits of mobile telephony, we look at purely intangible benefits, which are difficult to value, may not have direct economic benefit, but will certainly enhance and promote the growth of culture, society and societal ties. Here, our analysis includes discussion of the mobile phone as a tool for: (a) aiding disaster relief; (b) enabling the dissemination of locally-generated and locally-relevant educational and health information; and (c) promoting social capital and social cohesion.

3.3.1 Disaster Relief

Chipchase (2006) analyzed the value of the mobile phone as a fixed identity point, which can be immensely valuable to populations that are constantly on the move – displaced by drought, floods, wars or weak economies – in terms of, not just enhancing business opportunities, but also keeping in touch with one’s home community, either in an emergency or more everyday basis.

Deloitte (2008) offered a specific example. In 2007, during severe flooding in Indonesia, DiGi was able to identify all its subscribers in Malaysia that were registered as being immigrants from Indonesia and offered them free airtime. Mobile operators have also been active in disaster relief efforts in Pakistan and Thailand, providing emergency-related communications infrastructure.

3.3.2 Education & Health

Mobile services are being used to disseminate locally-generated and locally-relevant educational and health information, in order to target rural communities, whose populations are typically have low levels of education and income and would not otherwise benefit from such information. There is evidence to suggest that this type of benefit could save lives in rural communities.

3.3.3 Social Capital and Social Cohesion

Social capital or social cohesion could be one of the most important forms of intangible benefit – and yet it is also the most ill-defined and slippery. Fukuyama defines it as ‘an instantiated informal norm that promotes cooperation between two or more individuals’. Putnam defines it as ‘features of social life - networks, norms and trust – that enable participants to act together more effectively to pursue shared objectives. Woolcock refers to ‘the information, trust and norms of reciprocity inhering in one’s social networks’. Either way, economists are interested in social capital for its contribution to productivity and spillover from the individual to the group: a network effect or social externality, and it is clearly an impact that mobile phones can provide.

Goodman (2005) found that there were links between mobile usage, rural communities and social capital in his study of communities in South Africa and Tanzania. Mobiles facilitated three types of social capital: as an amenity & shared commodity; to mediate strong links (with family and friends and other community members) and to mediate weak links (with individuals ‘outside’ the community, e.g., businessmen, government officials, tradesmen, etc.)

4 Global Emerging Trends

It is widely acknowledged by industry insiders and outsiders alike that the mobile telephony business is fast-changing and highly responsive to consumer demand – in both the developed and developing worlds. Dynamic changes in technology present telecommunications providers with the challenge of supplying an integrated data, media and voice service at higher speed, yet lower cost (Kaul et al 2008). In this section we examine three prevailing global trends that impact our expectations of mobile telephony take-up and usage in rural communities.

First is the overarching global trend of *converged applications* and *converged devices*, i.e. the idea of a single converged mobile device, which can perform multiple functions. The idea of converged applications and converged devices have so far come hand-in-hand, enabling us to: ‘close the gap between the *devices* we use to contact people when we need information and the *applications* and business processes where we use that information’ (Gates, 2006). Yet what does this mean for the developed world? Many parts of Africa experienced a surprising boom in uptake, together with creative usage, when expensive fixed line telephony was substituted with less expensive mobile telephony. It may be that rural communities, who previously did not have access to converged functionality (e.g., camera, multimedia, etc.) will similarly find creative ways to apply them.

Second is the evolving *pricing strategies* and *revenue streams*. In the developed world, revenue has migrated from voice to data and IP. Will the developed world follow? In other words, applications and usages are evolving, along with pricing models and revenue streams. Whilst it may be true that rural communities can find innovative ways to apply technology not previously available to them (e.g., Indian fisherman finding out where to land their catch), none of this would be possible without a new pricing model that has re-valued SMS from a mere 10% side player in revenue streams to a main staple. Similarly, if multimedia functions could also be price-dropped from an elitist, overpriced niche product for tech geeks to a commoditized mass market necessity, these functions could drive rural economic and social transformation.

Third is *social mobility* and *virtual communities*, e.g. blogging, user-generated content, and Wikis. These new trends have put content production in the hands of the end user. For rural communities, access could mean real-time access to relevant content, created among the community and by the community to address pressing issues, perhaps initially education and health, but increasingly other social functions. Information could be shared between rural communities within the same country and even globally – decreasingly isolation, flattening the learning curve and removing the need to reinvent the wheel for every type of community initiative: from education, finance, health, microfinance, private sector development, and many other arenas.

5 Conclusion

In conclusion, there is considerable evidence to suggest that the economic and social benefit of mobile telephony will be highest in rural areas, which currently have less telephony services. Both poverty and lack of information are common bed partners. Thus, the dissemination of information together with serving rural areas has double anti-poverty imperative. Studies have attributed multiple benefits to the mobile phone: from lowering negative aspects (e.g., corruption, crime, high prices) to raising positive aspects (e.g., levels of education, efficiency, health). Such benefits already witnessed in the developing world can also spread to the developing world, provided the right level of access and pricing are put into place.

It is clear that the deployment of mobile phones does have a multi-dimensional positive impact on sustainable poverty reduction. Thus, going forward, it remains important to make the mobile phone as cheaply and widely accessible as possible. This involves two important development

dimensions: cost and distribution. *Cost* of devices and services have been declining, as developed world markets saturate and mobile operators and service providers increasingly compete for a share of the dwindling developing world market. Rural access seems a logical next step in global penetration – and development partners, the government, the private sector, and the World Bank have all acknowledged its importance.

However, in order to achieve the maximum impact, it remains vital to continue the evaluation of the development impact of mobile phones on sustainable poverty reduction to help identify relevant applications and business models, which would maximize the economic and social benefits, whilst minimizing costs, both start-up and ongoing, for the mobile operator, so these are not passed on to the end user. Moreover, whilst it is easier to measure the economic and tangible benefits, a clear, sophisticated methodology for measuring the social and intangible benefits is yet to be developed. Yet, in rural communities, where family, kinship and societal ties are often stronger than in urban communities, these benefits remain the compelling yet untold story.

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