Aalto University
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Review of benefits of mobility in the Base of the Pyramid (BOP) markets

Organization and Management

Master's thesis

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Abstract

Mobile phones have become the primary form of communication in both developed and developing countries. The spread has been fast and mobile phones have made a bigger difference to the lives of more people and quicker than any previous technology. The world has crossed the 5 billion in mobile connections mark. At the end of 1990 there were just 11 million mobile subscribers. Mobiles provide a unique way of reaching the masses of people, which have been hard or impossible to reach otherwise, especially in the remote places of the world.

Mobile phones are one of the only devices reaching nearly all consumers at the Base of the Pyramid (BOP). This group of people is the largest, but the poorest socio-economic group in the world. These approximately 4 billion people have been ignored by the multinational companies until very recently. Being connected is one of the main building blocks of the digital societies and mobile phones are bridging the digital divide. Being connected virtually seems to be all the time more important part of development and functioning of the modern societies both in the developed and developing world.

Objective of the study

The purpose of this thesis was to build a framework of key impact areas and dimensions of mobility and present a holistic picture of this wide phenomenon by answering the question: What types of benefits can mobile technology provide at the BOP markets?

As the whole phenomenon of benefits and impacts of mobility is abstract and the impacts are wide reaching, a simplified framework of the phenomenon was needed. The aim was to widen the theoretical discussion and theory formulation concerning the benefits of mobility. The purpose was also to examine the affordability and accessibility restrictions in the field of mobile communications at the BOP.

Data and methodology

The primary data of the study consist of 43 discussions with experts from Nokia as well as researchers and active players in the field of Information and Communication technology (ICT). This thesis has journalistic properties as discussions with experts have been combined with wide amount of other content, such as, surveys, researches and blogs.

Findings

This thesis widened understanding of how people use mobile phones at the BOP. Mobile phones have impacted on how people live, work, communicate and socialise locally and globally. The wide reach and sheer magnitude of mobile communications change the functioning of societies. Thesis demonstrated multiple benefits of mobile phones: from decreasing negative aspects (e.g., corruption and high prices because of information asymmetry etc.) to highlighting benefits (e.g., education and health reach, energy efficiency, electoral oversight). All these impacts can be achieved only if the right levels of access and pricing are achieved. Accessibility and affordability aspects are very crucial for low income consumers in the BOP markets.

Keywords:

Base of the Pyramid, BOP, emerging markets, mobile technology, mobile phone, affordability, accessibility, reverse innovation, impact

Tiivistelmä

Matkapuhelin on ensisijainen viestinnän väline sekä kehittyneissä että kehittyvissä maissa. Kehitys on ollut nopeampaa kuin millään muulla viestintävälineellä tai teknologialla aikaisemmin.

Maailmassa on yli 5 miljardia matkapuhelimen käyttäjää. Vuonna 1990 käyttäjiä oli ainoastaan 11 miljoonaa. Mobiilimedia tarjoaa ainutlaatuisen tavan tavoittaa valtavia määriä ihmisiä, joita muuten olisi vaikeaa tai mahdotonta tavoittaa, erityisesti kehitysmaiden maaseudulla.

Matkapuhelimet ovat harvoja laitteita, joita lähes kaikilla kuluttajilla on mahdollisuus käyttää vähävaraisilla BOP-markkinoilla. BOP-markkinoilla (Base of the Pyramid) tarkoitetaan sosioekonomisesti vähävaraisinta väestöryhmää, joka koostuu noin 4 miljardista ihmisestä. Monikansalliset yhtiöt ovat vasta viime aikoina alkaneet kiinnostua tästä kuluttajaryhmästä. Mahdollisuus langattomaan viestintään on eräs tärkeimmistä digitaalisten yhteiskuntien rakennuspalikoista ja matkapuhelin on yksi väline digitaalisen kahtiajaon poistamisessa maailmasta. Langaton viestintä on enenevässä määrin yhä tärkeämpi tekijä modernin yhteiskunnan kehittymiselle ja toiminnalle sekä kehittyneissä että kehitysmaissa.

Tutkimuksen tavoitteet
Opinnäytetyön tarkoituksena oli rakentaa malli matkapuhelinviestinnän keskeisistä vaikutus- ja osa-alueista sekä luoda kokonaisvaltainen kuva ilmiön laajuudesta vähävaraisilla BOP-markkinoilla.

Yksinkertaistetulle mallille on tarvetta, koska matkapuhelinviestinnän vaikutukset ovat laajoja ja monialaisia. Tavoitteena on myös laajentaa teoreettista keskustelua ja teorian muodostusta matkapuhelinviestinnän tuomista eduista. Tutkimuksen tavoitteena on ollut myös selvittää, mitä vaikutuksia matkapuhelinviestinnän edullisuudella ja pääsyllä sen piiriin on BOP-markkinoilla.

Data ja metodologia
Tutkimuksen primääridata koostuu 43 keskustelusta asiantuntijoiden kanssa. Asiantuntijat ovat Nokian työntekijöitä sekä muita asiantuntijoita ja tutkijoita kommunikaatio- ja informaatioteknologian alalta. Opinnäytetyö sisältää journalistisia piirteitä, sillä asiantuntijoiden kanssa käytyjen keskustelujen sisältö on kokonaisvaltaisen mallin rakentamiseksi yhdistetty laajaan muuhun sekundääridataan. Aineisto koostuu erinäisistä selvityksistä, tutkimuksista, blogeista ja case-esimerkeistä.

Löydökset
Opinnäytetyö laajentaa ymmärrystä siitä, miten ja mihin käyttötarkoituksiin BOP-markkinoiden ihmiset käyttävät matkapuhelinta. Matkapuhelimet ovat vaikuttaneet siihen, miten ihmiset elävät, työskentelevät, kommunikoivat ja ovat toistensa kanssa tekemisissä paikallisesti ja globaalisti. Matkapuhelinviestinnän käytön laajuus muuttaa väistämättä yhteiskuntien toimintaa. Opinnäytetyö toi esille useita matkapuhelimien tuomia etuja, kuten ostohintojen laskemisen, koulutus- ja terveydenhuoltopalvelujen jakamisen, energiatehokkuuden ja vaalien valvonnan. Nämä hyödyt voidaan saavuttaa BOP-markkinoilla ainoastaan, jos matkapuhelinviestimien käyttö (accessibility) on ylipäätänsä mahdollista ja sen käyttökustannukset (affordability) ovat sopivat.

Avainsanat
BOP, BOP-liiketoiminta, kehittyvät markkinat, mobiiliteknologia, matkapuhelin, käyttökustannukset (affordability), matkapuhelinviestimien käyttö (accessibility), käänteinen innovaatio, vaikutus

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LIST OF ABBREVIATIONS AND ACRONYMS

%/a	=	Annual growth rate
%	=	Percentage
&	=	And
$	=	United States Dollar
£	=	Great Britain Pound
3 A's	=	Affordability, Accessibility and Availability
3G	=	Third Generation
AIDS	=	Acquired Immune Deficiency Syndrome
ARV	=	Anti-retroviral
ARPU	=	Average Revenue Per User
BAU	=	Business As Usual
BBC	=	British Broadcasting Corporation
Bn	=	Billion
BOP	=	Bottom of the Pyramid
BRIC	=	Brazil, Russia, India and China
CD	=	Compact Disc
CGAP	=	Consultative Group to Assist the Poor
Co.	=	Company
CPP	=	Calling Party Pays
CO2	=	Carbon Dioxide
CO2e	=	Carbon Dioxide emissions
CS	=	Connectivity scorecard
DVD	=	Digital Versatile Disc (formerly Digital Video Disc)
E-	=	Electronic
EC	=	European Community
E.g.	=	For example
EIP.	=	Embedded Innovation Paradigm
EIU.	=	The Economist Intelligence Unit
EM	=	Emerging markets
EMEs	=	Emerging markets
EPA	=	The US Environmental Protection Agency
ERT	=	European Round Table
ESA	=	European Space Agency
FAO	=	Food and Agriculture Organisation of the United Nations
FDI.	=	Foreign Direct Investment
Fig.	=	Figure
G	=	Gram

GDP	=	Gross Domestic Product
GPS	=	Global Positioning System
GSMA	=	(Groupe Spéciale Mobile) Association
GSM	=	Global System for Mobile Communications
GtCO2e	=	Anthropogenic greenhouse gas emissions
H	=	Hour
HIV	=	Human Immunodeficiency Virus
IBM	=	International Business Machines
ICT	=	Information and Communication Technology
ICT4D	=	ICT for Development
IDRC	=	International Development Research Centre
IMF	=	International Monetary Fund
IPS	=	Inter Press Service
ISO	=	International Organisation for Standardisation
IT	=	Information Technology
ITU	=	International Telecommunication Union
IWS	=	Internet World Stats
Kg	=	Kilogram
Km	=	Kilometre
Km/h	=	Kilometres per hour
Lb	=	Pound
LBS	=	Location-based services
LC	=	Low-Cost
Ltd.	=	Limited
m^2	=	Square metre
m^3	=	Cubic metre
M-, m-	=	Mobile
MDG	=	Millennium Development Goals (UN)
MMS	=	Multimedia Messaging Service
MNC	=	Multi National Corporation
MD4	=	Mobiles For Development
MIT	=	Massachusetts Institute of Technology
m-o-m	=	Month on month
Mr.	=	Mister
Mt	=	Metric Tons
MTN	=	Mobile Telephone Networks (MTN Group Ltd.)
n.a., …	=	Not available

NDG	=	Nokia Data Gathering
NGO	=	Non-Governmental Organisation
NLT	=	Nokia Life Tools
NSN	=	Nokia Siemens Networks
OECD	=	Organisation for Economic Co-operation and Development
Oz	=	Ounce
PACE	=	Programme for Accessible Health, Communication and Education
PC	=	Personal Computer
PCM	=	Please Call Me
PDA	=	Personal Digital Assistant (electronic handheld information device)
PPP	=	Purchase Power Parity
P2P	=	Peer to Peer
RPP	=	Receiving Party Pays
ULC	=	Ultra Low-Cost
SARS	=	Severe Acute Respiratory Syndrome
SIM	=	Subscriber Identity Module
SMS	=	Short Message Service
TCO	=	Total
TOP	=	Top Of the Pyramid
TTC	=	Text to change
Txt	=	Text
UK	=	United Kingdom
UN	=	United Nations
UNU	=	United Nations University
UNESCO	=	United Nations Educational, Scientific, and Cultural Organization
UNEP	=	United Nations Environment Programme
US, USA	=	United States of America
VAT	=	Value Added Tax
Vs.	=	Versus
WB	=	World bank
WGI	=	The Worldwide Governance Indicators
WHO	=	World Health Organisation
WITSA	=	World Information Technology and Services Alliance
WST	=	World Service Trust (BBC)
y-o-y	=	Year on year

1 Introduction and purpose of the study

1.1 Background of the study

Mobile phones have become the primary form of telecommunication in both developed and developing countries. The spread has been fast and mobile phones have made a bigger difference to the lives of more people, more quickly, than any previous technology (The Economist, 2009).

The world has the crossed the five billion in mobile connections mark, and should reach six billion in the first half of 2012 (GSMA, 2010). Coverage has expanded and mobile phone subscriptions in developing countries have increased by over 500% since 2000 (Bhavnani et al., 2008). By the end of 1990 there were just 11 million mobile subscribers; the global mobile penetration[1] now stands at 74%, up from 60% at the end of 2008. For example, Africa is not far behind and has a level of 52% (Rethink Wireless, 2010).

Simply because of the huge scale in adoption and use, one could think that the impact has also been wide ranging. And it has as mobiles can be the first and the only means of communication especially in the developing countries. The mobile medium also provides a unique way of reaching the masses of people, "the mobile audience", which have been hard or impossible to reach otherwise. Reaching the rural people especially in the remote places of the world is extraordinary. Mobile phones are one of the only devices reaching nearly all consumers at the Base of the Pyramid. This group of people is the largest, but the poorest socio-economic group in the world. These approximately 4 billion people have been ignored by the multinational companies until very recently.

Being connected is one of the main building blocks of the digital societies and mobiles are one of the tools bridging the digital divide. Being connected virtually seems to be all the time more important part of development and functioning of the modern societies both in the developed and developing world. Distant localities become linked in a way that constitutes social connections across time and space (Giddens, 1990, p.64). This is very much linked to the discussion of globalisation and localisation.

[1] Mobile phone penetration rate is a term generally used to describe the number of active mobile phone numbers (usually as a percentage) within a specific population.

1.2 Base of the Pyramid — untouched economic potential?

What is very much linking the mobile technology and Base of the Pyramid approach (BOP) is the economies of scale, reaching the masses. BOP is calling a paradigm shift by stating that the large mass of poor population in the world actually represents untouched economic potential. BOP market is especially about volume. Margins are likely to be low, but unit sales high (Hart, 2005, p.138). The two-third of the world's 5 billion mobile users lives in the emerging markets (Cloud Computing blog, 2010).

Nearly everyone connected through mobile phones is bringing special value and a medium for reaching the BOP customers. There is a widespread belief that the potential to scale and replicate development efforts via the mobile phone is large. For this reason, a growing number of NGOs, businesses and government agencies are developing mobile phone-based information services for the poor (Lehr, 2008). Everyone connected produces a network effect that means the value of a product or service increases as more people use it. The more people own telephones, the more valuable the telephone is to each owner. This creates a positive externality because a user may purchase their phone without intending to create value for other users, but does so in any case.

Another important linkage between the mobile technology and BOP is that the BOP communities (especially rural) are physically and economically isolated and better communication linkages are essential for sustainable growth and development. This means linking *connectivity to prosperity* (Hart, 2005, p.148).

However, it is still too early to link mobiles to the poverty reduction. According to Matti Tedre, a professor of computer science in University of Eastern Finland and Tumaini University in Tanzania: *"There are good examples of how innovative uses of mobile technology can help the poor, but they are not examples of mobile phones per se necessarily and inevitably alleviating poverty"*(Private discussion).

Still mobile phones seem to be everywhere. Farmers are able to access market information through their phones, increasing income in some cases by up to 40 %. Casual labourers can advertise their services and avoid downtime waiting on street corners for work to come their way. Unemployed youth can receive alerts about job vacancies. And, for the first time, the unbanked can transfer money to relatives, or make payments for goods and services, through their mobile phones. Mobiles phones also provide health information and advice, remind

people when to take their medication, and allow citizens to engage more actively in civil society by monitoring elections and helping keep governments accountable (Banks Blog, 2010). Mobiles can also be used for educational purposes or to promote sustainable living by diminishing the need to have many separate devices by providing many gadgets in one device such as an alarm clock, a (video) camera, a calculator or a music player.

However, the fact that mobiles are everywhere is not necessarily a positive thing e.g. from an environmental perspective as more material and energy resources are needed in order to meet the growing demand. In addition, people change their phones frequently and only a few recycle them. Average life span of a mobile phone ranges from 12 to 18 months (The US Environmental Protection Agency, 2011). Also as mobiles are more and more used as mini computers the capacity growth means that the batteries of mobiles need to be charged almost daily when earlier charging might had happened only on a weekly basis. Other potential negative aspects may include, for example, concerns that mobile phones are causing increases in brain tumours and for this reason some countries, Finland among others, have advised moderate use of mobile phones for children (STUK, 2009).

1.3 Impact of mobile communication — widening the understanding

The impacts of mobile communication vary in the different fields of society. Many mobile services, solutions and projects are still at the trial stage. There is little hard evidence available and the evidence available is mostly anecdotal. The majority of the hard evidence concerns the economic and financial impact of mobility, such as the growth of mobile penetration in relation to the growth of GDP. However, the anecdotal evidence seems much more interesting as it usually consists of stories about the lives of people and the ways mobiles have changed their behaviour and surroundings.

The primary interest for conducting this study is to learn more about what is known and what is not known about the different impacts of mobile communications to individuals and societies. The mobile industry has a new challenge: to understand better how its technology is being used to provide better products and services for consumer needs as well as easing and extending the co-operation within the mobile Ecosystem to ease the *affordability and accessibility* of mobile communications. Ecosystem is a set of players who come together to deliver the experience or product to the end user in any industry. Mobile ecosystem is here understood as consisting of consumers, policy makers (regulators), device manufacturers, mobile network operators, mobile application developers, different mobile service providers

(e.g. airtime sellers) and NGOs.[2] Two-way knowledge sharing within and between the ecosystem about the different impacts of mobility and the usage patterns are the key to success and survival in today's networked society. After all, the better a business understands its target market realities, the better it should perform by having satisfied customers.

However, talking about *impacts* of mobility can still be seen as an exaggeration because of the new nature of the phenomenon. It would be preferable to talk about the possible impacts of mobility. To be able to talk about the actual impacts, more time series data would be needed, so that it would be possible to say what has really changed compared to the situation before. An easy example could be that before introducing, for example, a mobile education service to a certain village, it would be necessary to conduct a documented study before the launch and a second one sometime after the service has been launched. Several ethnographers and anthropologists use these methods in a number of research projects around the world. However, whether the change was due to mobile phones or some other factors is still an open question. Another restriction is that the change can be non-linear and the pre-conditions can be difficult to define. In ICT4D Symposium, September 2010 in Barcelona, Spain Professor Tim Unwin pointed in his keynote speech an important element which makes measuring the impact more difficult: people often do not know why they are doing something. Unwin also stressed that in the end the questions of how and why something has happened are more important than what has happened. Moreover, one cause may have a very different impact in another setting. Or, there may be multiple causalities.

Still it is crucial to understand the local impact in different localities. Jussi Impiö, Research Leader of Nokia Research Africa (NORA) in Nairobi: provides insight to impacts of mobile communications in the African context:*" Mobile phones are changing societies in Africa profoundly. Locality, even isolation, cultural, ethnical and economical has been characteristically African until now. Trough mobile devices many people get exposed to another culture, opportunities and challenges for the first time. This will also bring along challenges which industry should be able to react to or even better prepare beforehand. Some of these challenges are related to competition on resources, ethnic conflicts, threat to rare languages etc. These challenges are inevitable in such a dramatic cultural process, they should be managed in such manner that damage is minimal and the benefit is greatest and so*

[2] Typically, the key actors in the mobile ecosystem value chain are operators, handset vendors, content owners, developers, publishers, aggregators, content distributors, advertising platform owners, advertisers, mobile platform owners and regulators (Telecom Circle, 2009).

that the future of mobile Internet looks African, enables local languages and cultural practices to stay alive in the digital age" (Private discussion).

1.4 Purpose of the study

The purpose of this thesis is to examine the different benefits of mobile communications in the BOP markets by creating a visual framework of the benefits on a range of key impact areas and dimensions of mobility.

The purpose of this framework is to visualise and demonstrate a holistic picture of the phenomena of the mobile communications in the BOP markets. Since the impacts and benefits of mobility is abstract and impacts are very wide-reaching a simplified and a holistic framework of the phenomenon is needed. This framework is one way to look at or to approach the world of mobility. The Framework also provides a structure and functions as a tool for the study.

The purpose of this study is also to examine the *affordability and accessibility* restrictions in the field of mobile communications in the BOP markets. Affordability and access are seen as the key factors and enablers of possible impacts of mobility. These factors need to be solved first so that mobile communication can reach the masses, the next billion users, by bringing the mobile phone to the hands of nearly everyone regardless of their location or income level.

The main focus of this thesis will be in the benefits of mobile communications. However, the negative or unintentional impacts will also be taken into consideration. Some elements can be positive or negative in different environments. The objective is to identify the key impact areas and dimensions of mobility in detail. The aim is to combine previous literature and research to the actual activities in the field of mobile communications in the BOP markets. The evidence of the study will be derived from a series of researches investigating the impacts of mobility, BOP literature as well as discussions with various experts. Also valuable insight to the phenomenon of mobility was gained in two Conferences in the field of ICT for development (ICT4D) and Mobiles for development (M4D): ICT4D Symposium, September 2010 in Barcelona, Spain and 2nd International Conference on M4D, November 2010 in Kampala, Uganda.

This paper aims at finding an answer to the following question:

- What types of benefits can mobile technology provide at the BOP markets?

1.5 Implementation of the study

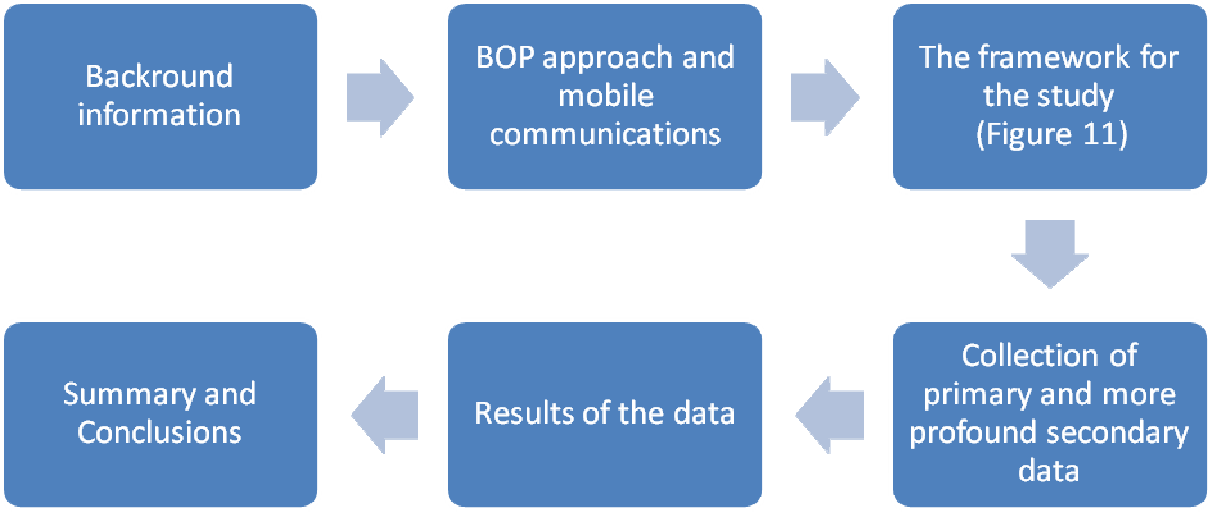
This thesis has been an assignment from Nokia and the author is a Nokia employee. For this reason the author has had wide access to information and many of the examples come from Nokia. An advantage of being a Nokia employee has been the access to different mobile experts. From the Nokia's perspective, the assignment was to concentrate on unexpected consequences and potentially harmful aspects. However the study is dominated by benefits.

The study is carried out in the manner shown in Figure 1. First the background information concerning the impact of mobiles is collected concerning the different impact areas. This information provides the foundation for the purpose and implementation of the study. The theoretical part of the study concentrates on the BOP approach and mobile communications. After this phase the theoretical frame of reference is formed and operationalized.

After the theoretical foundation the empirical collection of primary data takes place. The primary data of the study consist of discussions with experts from Nokia as well as researchers and active players in the field of Information and Communication technology (ICT). This thesis has journalistic properties as the primary data has been combined with wide amount of other content, such as, surveys, researches and blogs.

In the last phase, the results of the basic data of the empirical and secondary material are analysed. The collected information are summarised and the study is written in its final form with the conclusions included.

Figure 1 **Implementation of the study**



2 Literature review and framework

Mobile technology has been actively introducing services for the BOP customers. Many success stories can be found for example in the field of mobile banking and mobile learning.

Base-of-the-Pyramid or Bottom of the Pyramid (BOP) literature forms the main frame for the study. BOP approach was chosen as a frame because mobile phones seem to be one the unique devices that have reached nearly everyone and most of the case studies and examples in the mobile technology sector come from the developing growth countries. The actual impact of having a phone there is bigger and may bring larger benefit, not only to a user her/himself, but also to the whole community. When talking about the spread of mobile technology, we can truly talk about a mass scale adoption and for this simple reason impact in a wider sense. One more reason for choosing BOP is the larger mission of connecting the next billion people to Internet. For these masses of people the main and only access to Internet will be through their mobile phones as also the low-end phones are having better Internet browsers.

2.1 The Base-of-the-Pyramid approach — the next billion consumers

The Base of the Pyramid means the largest, but poorest socio-economic group in world. This group of approximately 4 billion people was forgotten and ignored in the eyes of multi-national companies until Professors C.K. Prahalad (in the book The Fortune at Bottom of the Pyramid in 2004) and Stuart L. Hart (in the book Capitalism at the Crossroads in 2005) encouraged businesses and decision makers to stop thinking of the poor as victims but as a vast group of value-demanding customers and consumers.

In the core of the BOP is also an understanding that the poor of today are the middle-class of tomorrow. Serving the BOP is very much about building long-term customer relationships, creating a business environment and opportunities for the future.

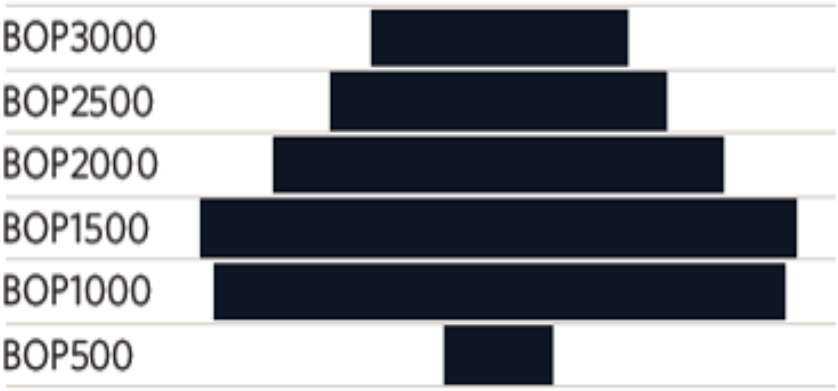
According to the literature, the BOP approach seeks to solve the problems of disadvantaged groups within a society while simultaneously creating new business opportunities and new revenue sources for companies (see e.g. Prahalad, 2005; Prahalad & Hammond, 2002; Prahalad & Hart, 2002; WBCSD, 2004; Banerjee & Duflo, 2006; Kahane et al., 2005; Lodge & Wilson, 2006; Wilson & Wilson, 2006).

However there are still many different kinds of barriers for reaching the BOP consumers. For Prahalad, the creation of consumption capacity among the BOP consumers is based on three simple principles, the 3 A's: *Affordability, Access,* and Availability (Prahalad 2005, p.43). Anderson & Markides add a fourth A – availability, affordability, awareness and acceptability (Anderson & Markides, 2006; Anderson, 2006, pp.12-13). In the context of this study the aspects of *affordability and access* will be taken into consideration later in detail.

2.1.1 Potential of the BOP market & ICT — is BOP a financially attractive market?

The 4 billion people at the Base of the economic Pyramid —all those with incomes below $3,000 in local purchasing power (2002 PPP)—live in relative poverty (Figure 2). Their income in current US dollars ($) is less than $3.35 a day in Brazil, $2.11 in China, $1.89 in Ghana, and $1.56 in India. Still Hammond et al. (2007, p. 14) state that together these 4 billion people have a substantial purchasing power, estimating that the total size of the BOP consumer market to be $5 trillion (Figure 2). Regional differences are apparent; rural areas dominate most BOP markets in Asia (68% vs. 32%) and Africa (no number data available) and urban areas dominate in Latin America and the Caribbean (77% vs. 23%).

Figure 2 **BOP market - $5 trillion — total by income segment**

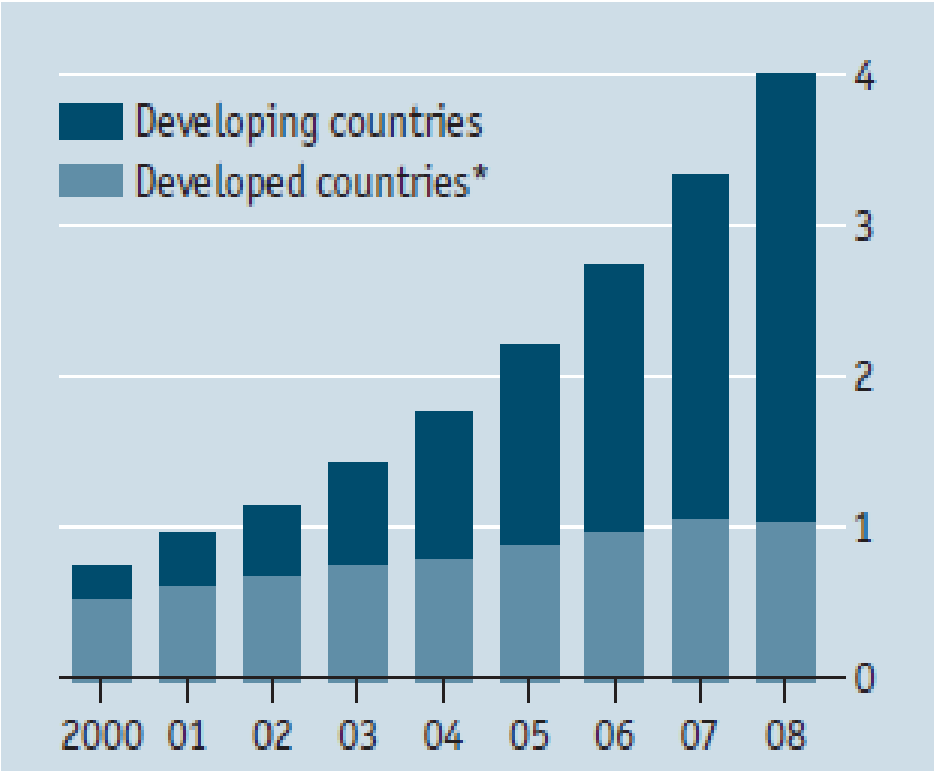


Source: Hammond et al., 2007, p. 13.

In 2000 the developing countries accounted for around one quarter of the world's around 700 million mobile phones. By the beginning of 2009 their share had grown to three quarters of a total which by then had risen to over 4 billion (Figure 3). Now the world has the crossed the five billion in mobile connections mark (GSMA, 2010). This does not mean that over 5 billion people have mobile phones, because many in both rich and poor countries own several handsets and subscriber identity module (SIM) cards. With saturated developed markets, the developing world's rural poor will account for most of the growth in the coming years (Figure

3). According to GSMA the total mobile phone subscriptions will reach 6 billion by 2013, with half of these new users in China and India alone (GSMA, 2010).

Figure 3 **Where to look for growth — mobile phone subscriptions, bn**



Secondary source: The Economist, 2009, p. 2. (Source: World Bank, ITU
Note: OECD members

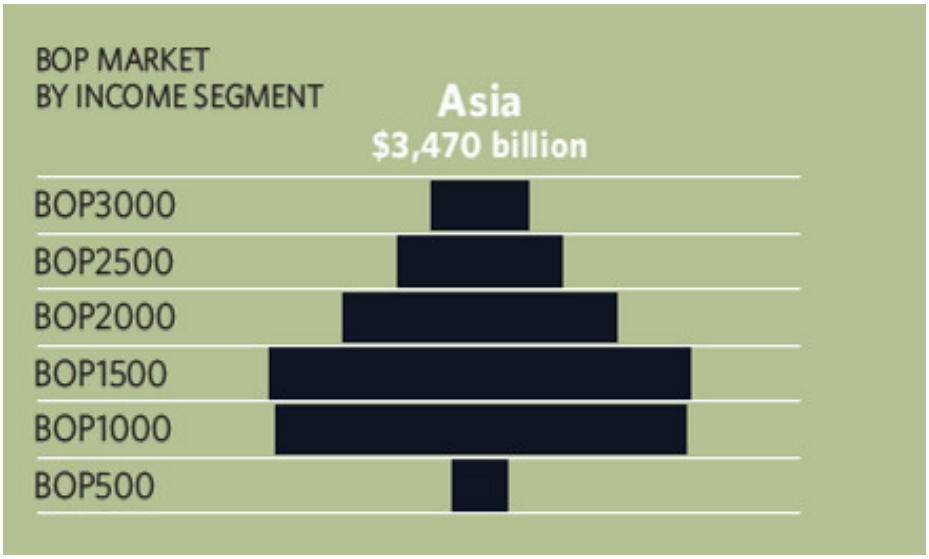
How much do the BOP households spend on ICT annually? The most recent data is from 2005, when an average BOP household spending for the median country was $34 in Africa, $54 in Asia, and $107 in Latin America (Hammond et al., 2007, p. 29). Eastern Europe is not included in the study because of the European Union membership for most of these countries.

Urban areas dominate the BOP markets for ICT in all regions. Mobile networks usually start in urban areas and only then spread to rural areas. In Brazil, for example, the BOP market for ICT is 97% urban, and average annual spending by urban BOP households ($203) is seven times that by rural BOP households. The ICT sector is also an exception, with spending still typically concentrated in the upper income segments of the BOP in all regions (Hammond et al., 2007, pp. 27, 29, 44-45 & 48).

BOP in Asia (including the Middle East)

Asia (including the Middle East) has by far the largest BOP market: 2.86 billion people with an income of $3.47 billion (Figure 4). This BOP market represents 83% of the region's population and 42% of the purchasing power—a significant share of Asia's rapidly growing consumer market, especially in the rural areas. Asia has also the largest measured regional BOP market for ICT, $14.3 billion (Hammond et al., 2007, pp. 26 & 44-45). ICT is urban centred; for example India's BOP market for ICT is 51% urban, with urban BOP households outspending to rural ones 3:1; Pakistan and Indonesia have even larger urban shares of the BOP market, 69% and 93% (Hammond et al., 2007, p. 48).

Figure 4 **BOP market by income segment in Asia**

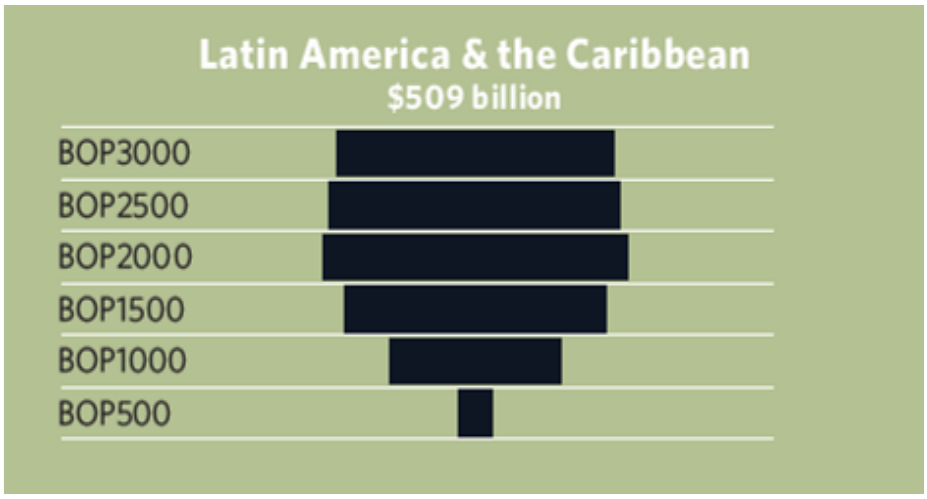


Source: Hammond et al, 2007, p. 19.

BOP in Latin America

In Latin America the BOP market of $509 billion includes 360 million people, representing 70% of the region's population but only 28% of total household income, a smaller share than in other developing regions (Figure 5). However, in contrast to Asian market the spending is focused in urban areas. Latin America's measured BOP market for ICT is $11.2 billion, less than in Asia (Hammond et al., 2007, pp. 9 & 44-45).

Figure 5 **BOP market by income segment in Latin America & Caribbean**

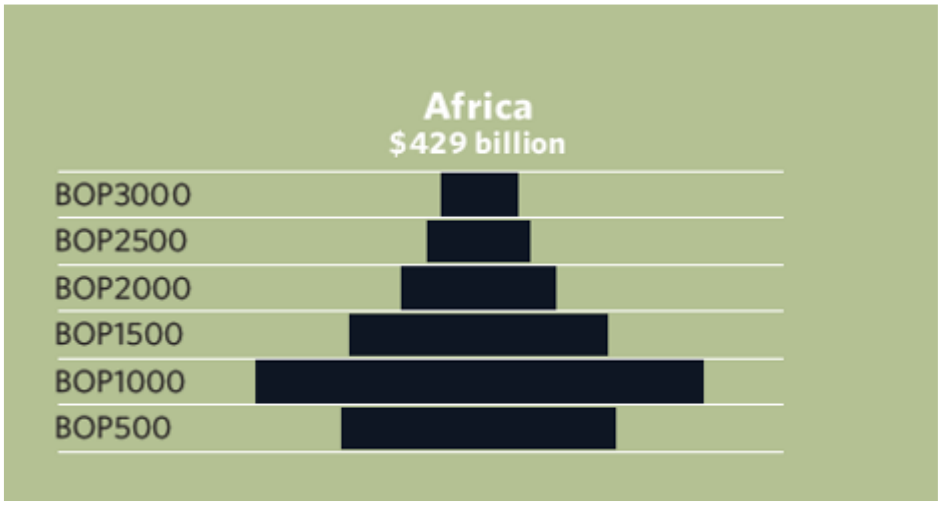


Source: Hammond et al., 2007, 19.

BOP in Africa

Africa has a slightly smaller BOP market, at $429 billion, but the BOP is by far the region's dominant consumer market, with 71% of the total purchasing power (Figure 6). Though smallest, the African ICT market is the most rapidly growing one (Hammond et al., 2007, pp. 9 & 44-45).

Figure 6 **BOP market by income segment in Africa**



Source: Hammond et al., 2007, p. 19.

The large mass of people at the BOP represents economic potential. Beside the vast customer base, serving the BOP consumers demand innovations in technology, products and services as well as new innovative business models. More importantly, it requires large companies to work collaboratively with civil society organizations and governments (London & Hart, 2004). Serving the BOP requires "out of the box" thinking. Companies should think differently, upside down and bottom up.

2.1.2 Reverse innovation — from developed to developing countries and vice versa

Innovation is not an exclusive right of developed countries. This study supports the concept of reverse innovation (Immelt et al., 2009), which refers to innovation developed for the developing world, but found also useful and relevant in the industrialized world.

Innovation in BOP markets can mean the flow of new concepts, ideas, and ways of doing things. The flow of innovative ideas, knowledge, and innovation can become a two-way street – from developed to developing countries and vice versa. Multi-National Corporations can help BOP markets to develop, but they can certainly also learn from BOP markets. The quality, efficacy, potency, and usability of solutions developed for the BOP markets can also be attractive for the top of the Pyramid (TOP) (Prahalad, 2005, pp. 49, 61-62). Simplicity could also be added as one attractive feature. C.K. Prahalad mentions five different ways in which resource-scarce developing countries can lead rich nations: 1) *affordability*, 2) leapfrog technologies, 3) service ecosystems, 4) robust systems, and 5) add-on applications (Prahalad, 2005).

The phenomenon of reverse innovation was originally described using a different term - innovation blowback - by Brown & Hagel in their 2005 McKinsey Quarterly article. In essence, their message warns that the periphery of today's global business environment is where innovation potential is highest. They are the places where unmet customer needs find unexpected solutions, where disruptive innovations and blue oceans[3] get birthed. Reverse innovation leads to products which are created locally in developing countries, tested in local markets and, if successful, upgraded for sale and delivery in the developed world (Bloomberg Businessweek, 2007).

Reverse innovation is not optional. According to Immelt et al. (2009) global companies need to do reverse innovation for defensive reasons, because if they don't come up with innovations in the poor countries and take them global, new competitors from the developing world will. Emerging market champions have not only proved highly competitive in their own markets, they are also going global themselves (The Economist, 2010, p. 1).

Typically, companies start their globalisation efforts by removing expensive features from their established products, and attempt to sell these de-featured products in the developing

[3] Blue Ocean Strategy: The book illustrates what the authors believe is the high growth and profits an organization can generate by creating new demand in an uncontested market space, or a "Blue Ocean", than by competing head-to-head with other suppliers for known customers in an existing industry

world. Instead, the products should be designed taken into consideration the special needs of the target market. The product innovation involves redesign of existing products or services to suit e.g. the affordability of the end-consumers (Roychowdhury and Manikutty, 2010, p. 7).
An understanding of the value proposition to BOP market consumers as well as their distinctive needs is essential. For example a dustproof phone cover or a flash light function in mobile phones is highly valued.

In Nokia there are two recent examples of reverse innovation coming from the BOP markets: A mobile learning programme "Learning mathematics though mobiles", which was first launched in South Africa in 2010 was subsequently taken into use in Finland. Another Nokia example is the "bike charger" designed for developing countries lacking electricity to charge mobile phones. Bike charger will certainly be a success also in the developed world, especially in countries with a strong cycling culture, such as Denmark.

A motivation for companies designing services for BOP markets is about future earnings and survival. As developing-country economies grow, some of this rural population will migrate to urban areas and as that happens, familiarity with brands they have encountered in rural areas will help them transition to companies' products in urban areas, helping secure future earnings (Vachani & Smith, 2010, p. 30). The conventional assumption has been that the poor are not brand-conscious. On the contrary, the poor are very brand-conscious. They are also extremely value-conscious by necessity. An aspiration to a new and different quality of life is the dream of everyone, especially for those at the BOP (Prahalad, 2005, pp. 13-14).

Prahalad (2005, pp. 13,16 & 99) brings to picture another interesting aspects as he states that BOP consumers are more willing to adopt new technologies, because they have less to forget. For example, moving to wireless communication from nothing is easier than moving to wireless from a strong tradition of landlines.

2.1.3 Challenges in the BOP — need for upside down thinking

One of the best-known BOP critics is Karnani (2007 & 2008), who criticises BOP for being concentrated in seeing BOP people mainly as consumers. He argues that the profit opportunities at the BOP are modest at best and any effort to alleviate poverty should consider the poor as producers. Companies should therefore revise their supply chains and emphasise buying from the BOP markets instead of selling to them. According to Karnani (2007, p. 109) the best way for private companies to help eradicate poverty is to invest in upgrading the

skills and productivity of the poor and to help create more employment opportunities for them.

London and Hart (2004, p. 360) stated that existing biases associated with top-of-the-Pyramid markets can blind managers from the realities of conducting business at the Base of the Pyramid. Relying on existing technology, products, partners, channels, and metrics cannot work as such. An entirely new strategy is needed in the BOP, which also came clear in the earlier chapter on innovation.

Rather than creating centrally developed 'one-size-fits-all' global solutions, or adapting solutions created elsewhere to local conditions, successful pursuit of base-of-the-Pyramid markets appears to require companies to build, consolidate, and leverage learning from the 'bottom up' (London and Hart, 2004, p. 366). Nokia Life Tools (NLT) is one example of tailoring the service to the BOP customer needs. According to NLT Services Rollout Manager Antti Vanhanen: "*NLT was built from the ground up on basis of local needs in emerging markets. The main gap NLT sought to address was access to information that was relevant for the users, many of who are poor and have very limited experience with modern technology. Using SMS technology NLT has been able to reach millions of consumers in remote rural areas and deliver information that has a direct impact on their daily lives. Currently, NLT covers services such as agriculture (market prices, weather, farming advice), education (learn English, exam tips), healthcare (disease prevention, mother and child care) and entertainment. To ease consumption of the information, the service UI has been designed to mimic the classic Nokia phone UI to give users a feeling of familiarity as they try the service for the first time"* (Private Discussion).

According to Seelos and Mair (table 1) challenges of BOP recommendations can be overcome. The need for companies to orchestrate multiple strategies aimed at different income levels can be avoided by having two separate organizations operating the pro-poor business model and the higher income business model respectively (Seelos and Mair, 2007, p. 60). In Nokia this is seen in practice by having a separate unit for producing high-end expensive smartphones and a separate unit for low-end mobile phones mainly sold in the developing growth economies. However this distinction will not be clear for a long time as in the near future most of the mobile phones will be considered as smartphones with Internet browsing capabilities.

Table 1 **Challenges and hurdles to BOP recommendations derived from the strategy literature**

	Recommendations from BOP research	Challenges and Hurdles
Ability to Create Value	Multiple strategies aimed at different income levels.	Lack of focus and spreading resources inadequote capabilities
	Need for new resources and capabilities.	Value known only in their existing use;value in new uses,particularly in BOP environment unclear.
	Local access of resources/capabilities.	Resource scarcity and lack of factor markets.
	Fundamental rethinking of business models and supply chains.	Causal ambiguity of finding the right configuration; difficulty of combining many individual factors into a complex business model.
	Multiple partnerships.	Alliances tend to fail; potential for conflict may limit effectiveness and efficiency.
	Selling to the poor.	Creates a focus on cost cutting because income levels are not increased.
Costs	Need for new resources and capabilities.	May take too long to be practical; cost-benefit assessment in new uses difficult.
	Local access of resources/capabilities.	Unclear what information is available to value them correctly and why they would create profits.
	Multiple partnerships.	Governance costs.

Source: Seelos and Mair, 2007, p. 51.

As seen in the table 1 the importance of the partnerships is highlighted in the BOP. Sometimes it might be necessary to collaborate with other companies, governments or organisations, sometimes everything must be done alone as certain suppliers or distributors might not exist at the BOP. For example, there can be gaps in the support activities and infrastructure, such as electricity or logistics (Rivera-Santos & Rufin, 2010). However, partnerships might also cost more time and effort compared to a received value. The fact is that localisation always causes extra costs and effort and those need to be evaluated to the expected benefits.

In addition, how to deliver is as important as what to deliver. A significant challenges for innovation in BOP markets centres around redefining the process to suit the infrastructure. For new BOP innovations, companies should also keep in mind the capability levels of customers as well as cultural aspects such as cultural importance of the cash money when e.g. planning a mobile banking system. Process innovation is a critical step in making products and services affordable and accessible for the poor. (Prahalad, 2005, p. 37).

2.2 Affordability & Accessibility — the key gatekeepers for benefits and impacts of mobility

Affordability and accessibility are seen as key gatekeepers for possible benefits and impacts of mobility. They are seen as preliminary conditions that the mobile technology can reach the BOP consumers in the first place and actually deliver any impact or benefit.

Mobile technology has changed the way the people are connected. According to Castells et al. (2004, pp. 28-37): the adoption of mobile communication technologies occurs for different reasons in different types of countries, which also affect the affordability and accessibility aspect. These factors include:

1. Level of economic development, measured by GDP.

Multinationals expect about 70% of the world's growth over the next few years to come from emerging markets, with 40% coming from just two countries, China and India (The Economist 2010, p.1).

2. Billing Systems: Prepaid vs. Contract.

The adoption of prepaid billing systems has significantly increased mobile penetration rates in developing countries.

3. Government Policy.

Institutional environments can cause developments to occur at different speeds because of their bureaucratic ability to control access to required technical resources such as spectrum[4].

4. PC Penetration.

Countries with lower PC penetration rates have been linked to higher uptake of mobile technologies, and vice versa; however there is no robust causal relationship. Mobiles may, however, be considered as substitutes in some countries where income and other factors have limited the adoption of PC and Internet access.

[4] Radio spectrum enables every type of wireless service including satellite systems, radar, mobile and fixed telecommunications, as well as broadcasting

5. Communication Preferences.

Cultural influences on communication preferences may play a part in the diffusion of mobile technologies; however, their effects remain largely ambiguous.

The adoption of mobile communication is interplay of a variety of factors. All these together have an impact on affordability and accessibility of mobile communication.

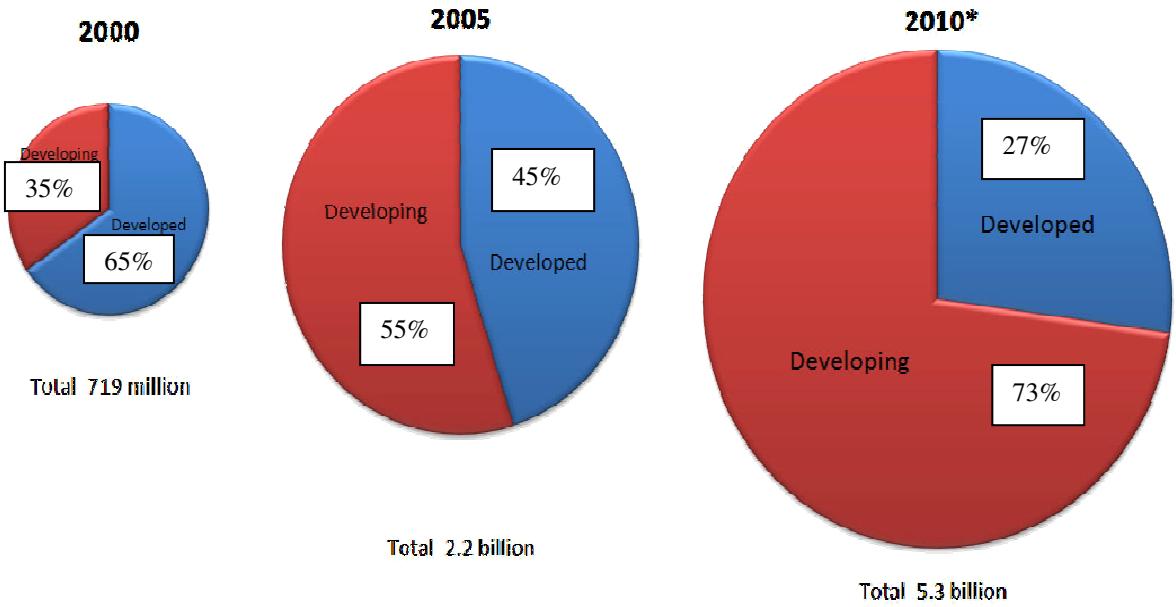
This study focuses on two aspects that are linked to the potential for scale in mobile connectivity: Affordability and accessibility. BOP approach talks about four aspects, 4 A's: Awareness, Affordability, Access and Availability (Prahalad 2005, p. 43; see also Anderson, 2006, pp. 12-13; Anderson & Markides, 2006) as the key ingredients to market development at the BOP. However, only affordability and accessibility will be examined in more detail in this thesis for the following reasons. First, the awareness is not seen as relevant as before since mobile phone penetration is so high and technology widely adopted. Nearly everyone can be expected to be aware of the existence of mobiles. Secondly, the availability is considered as a very similar concept to accessibility. By availability Prahalad means that a BOP consumer's buying decision is based on the cash they have at the given point in time. Availability is also linked to distribution efficiency. Because affordability and accessibility seem more relevant considering the topic of the thesis, the study will concentrate only on those.

2.2.1 Accessibility — mobile penetration & connectivity in the emerging markets

Mobile phone access will soon be universal (Figure 7).

Between 2004 and 2009, total mobile subscriptions in emerging markets (EMEs) witnessed a phenomenal period growth of over 200% reaching 2.6 billion in 2009 and accounting for 57.6% of the total subscriptions in the world. Of this, emerging Asia alone accounted for 36.1%. According to Informa Telecoms & Media's (2010b) forecasts, the number of active mobile subscriptions in India will rise to 1.2 billion by the end of 2013, making it the world's largest mobile market and accounting for 128% growth since the end of 2009. In China, the number of active mobile subscriptions will be 1.1 billion by the end of 2013, up by 43% since 2009 (Informa Telecoms & Media, 2010c).

Figure 7 **Mobile cellular subscriptions, by level of development**



Source: ITU World Telecommunication/ICT Indicators database[5]
Note: *Estimates

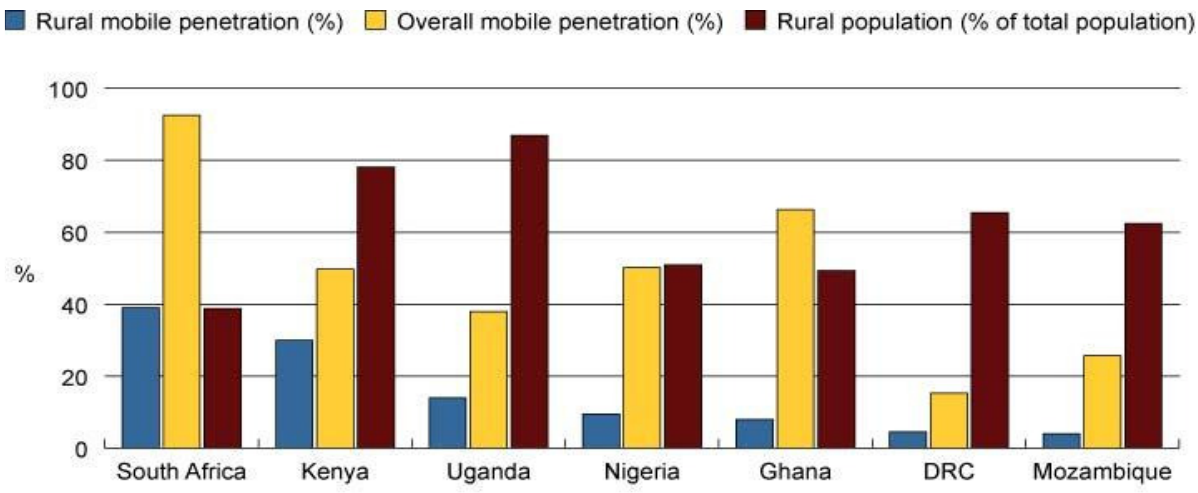
However there are strong language and literacy barriers with a scarcity of relevant and accurate mobile content available today. Smart handsets and data services are still out of reach for the majority of the world due to costs and access, restricting mobile services to BOP customers largely to the channels with the lowest common denominators: voice and SMS (Verclas, 2010).

Still with 90% of the world covered by a mobile signal, mobiles are one of the tools bridging the digital divide. Especially when taking into consideration ITU's calculations (Figure 7) about the development of the mobile subscriptions in the developed and developing world: 73% of total mobile cellular subscriptions were from the developing world in 2010.

From the accessibility perspective Africa has an interesting situation as mobile penetration in Africa is as high as 52% and at the same time only 25% of the continent has electricity (GSMA 2010).

[5] http://www.itu.int/ITU-D/ict/statistics/

Figure 8 **The mobile revolution — Has it reached rural Africa?**



Source: Informa Telecoms & Media

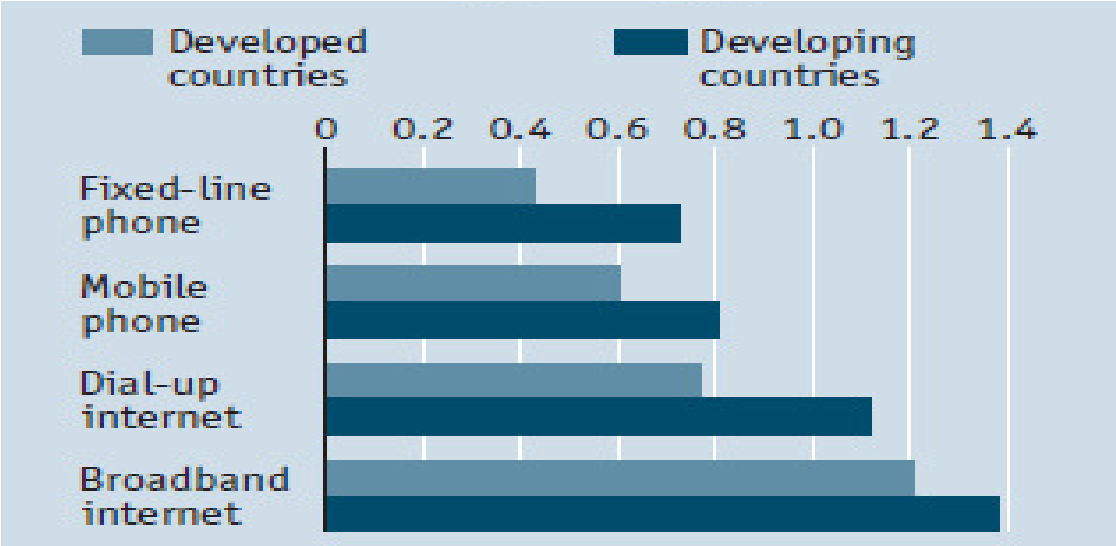
Source Informa Telecoms & Media, 2010b.

A relatively high rural penetration in Kenya is partly due to the dominance of a single operator in the shape of Safaricom, helped by its wide distribution network and its popular M-PESA mobile banking service, and partly due to a well-directed government-run universal access policy. Rural penetration is at its lowest in the DRC and Mozambique due to the reasons that the focus on universal policies from communications ministries is less clear and mobile operators are more concerned at ensuring higher adoption rates in urban areas (Informa Telecoms & Media, 2010b). *Government's ICT policy role is highlighted when talking about accessibility and affordability.*

For many of the BOP consumers, the first and the only access to Internet will be through mobile phones. As mobile phones have reached nearly everyone, the next task is to do the same for the Internet (The Economist, 2009). As Zhen-Wei Qiang's (2009) research shows, access to the Internet can provide an even bigger boost to economic growth than access to mobile phones (Figure 9). But to make the most of the Internet, users have to have a certain level of education and literacy. Also affordability aspect of using Internet is a barrier for many people living in the emerging growth economies. Africa is by far lagging the furthest behind as far as Internet usage is concerned: only 4% of the world's Internet users live there and penetration is around 7% (i.e. only seven people in every hundred use the Internet in Africa.). According to IWS data, there are also significant variations inside Africa itself. Half of the continent's Internet users can be found in just five countries (Egypt, Morocco, Algeria, Tunisia and Sudan), most of which are North African countries; South Africa must also be

mentioned among the most developed countries of the continent (Unesco, 2009b, pp. 13-14 & 49).

Figure 9 **Hierarchy of boosts — growth effects of ICT, percentage points***



Secondary source: The Economist 2009, 5 (Primary source: Zhen-Wei Qiang, 2009)
Note: *Increase in GDP growth per 10-percentage-point increase in telecommunications penetration

2.2.2 Affordability — determining who will be able to be part of today's digital society?

Why is it that a consumer in one country can afford a mobile phone, while a consumer in a different country, who is earning exactly the same income, finds ownership difficult or even impossible?

The affordability of mobile services is largely linked to regulatory decisions made by the government. However, the evidence (e.g. Figure 9) concerning the benefits of mobility for societies has changed governments' attitudes to positive towards Telecom industry.

One aspect of affordability is poverty penalty. Many in the BOP, and perhaps most, pay higher prices for basic goods and services than wealthier consumers—either in cash or in the effort they must expend to obtain those (Hammond et al., 2007). According C.K. Prahalad (2005, p. 12) the poverty penalty is a result of local monopolies, inadequate access, poor distribution, and strong traditional intermediaries.

As Inter-American development bank states: *it can be expensive to be poor*. The "poverty penalty" is increasingly viewed as a central reason for the persistence of inequality in many

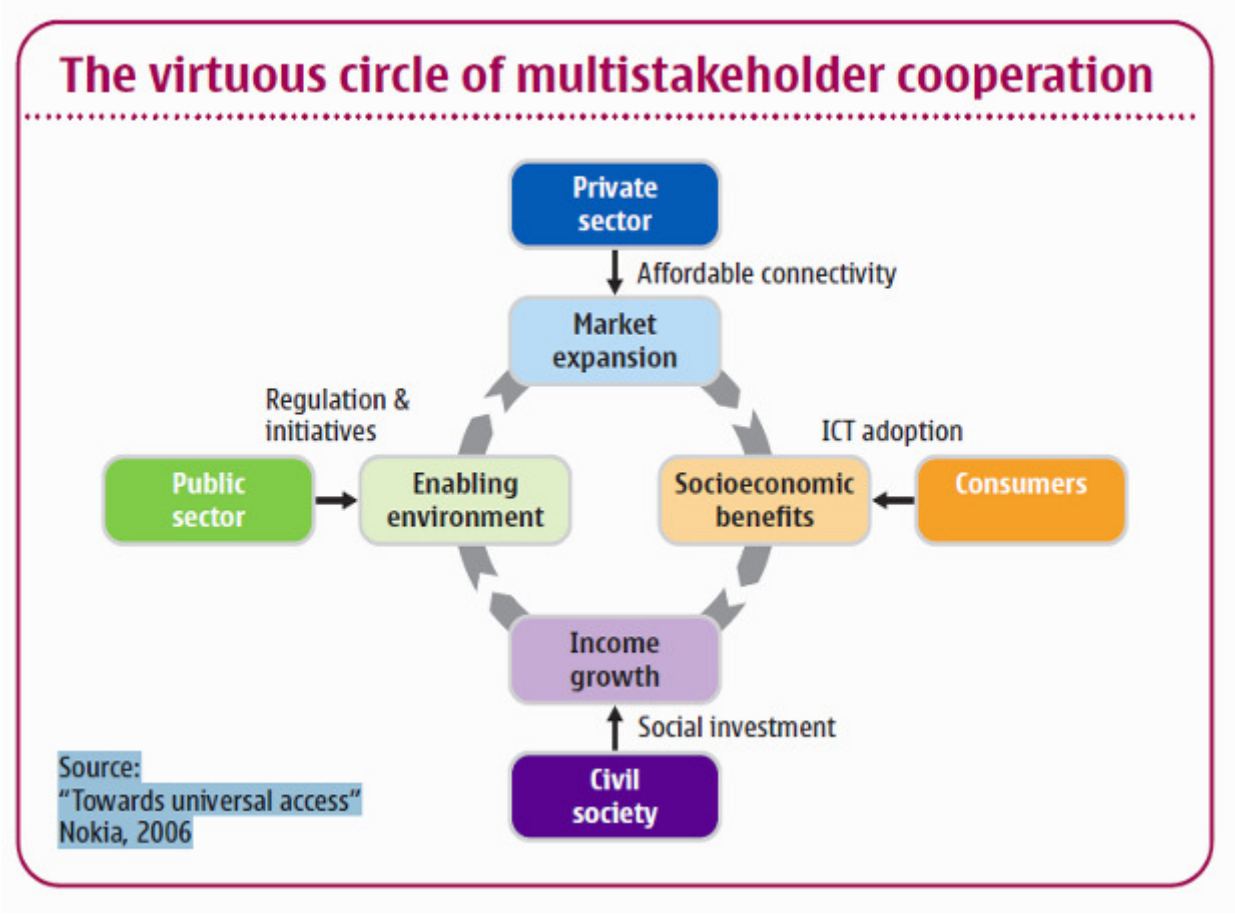
parts of the developing world. The problem isn't simply that the poor lack money. Rather, the problem stems from the high proportion of their modest income that people at the Base of the economic Pyramid must devote to meeting basic needs, and from the difficulty they have in obtaining credit (IDBAmerica, 2006). So ironically, the poorer you are, the more things cost: More in money, time, hassle and exhaustion (The Washington Post, 2009).

Partly because of poverty penalty, how to deliver is as important as what to deliver as the poor have unpredictable income streams (Prahalad, 2005, p. 37). Sachet pricing—packaging products in single-use or other small units that make them more affordable to the BOP—is widely used in the food sector and in ICT (Hammond et al., 2007, pp. 31-32). In mobile sector this means for example, that instead of paying for Rs. 30 a month for your ringtone, pay Rs. 1 every day. The same principle applies to buying prepaid airtime in very small entities. So called process innovation is a critical step in making products and services affordable for the poor (Prahalad, 2005).

In general, consumer spending on communications within EMEs has almost doubled between 2004 and 2009 increasing from $152 billion in 2004 to $314 billion in 2009 as a result of strong economic growth, rising disposable incomes and a growing urban population (GSMA, 2010). Although most of this growth is from urban areas in the emerging markets, huge potential remains in rural populations. Reaching these customers means making mobiles even more affordable (Expanding Horizons, 2009).

Customers at the BOP have low ARPUs - the magic number that refers to "the average revenue per user" that telecoms measure as a key profitability indicator - and very high price sensitivity, making sustainable business models more challenging for telecom industry (Verclas, 2010).

Figure 10 **The virtuous circle of multi-stakeholder cooperation for affordable and accessible communications**



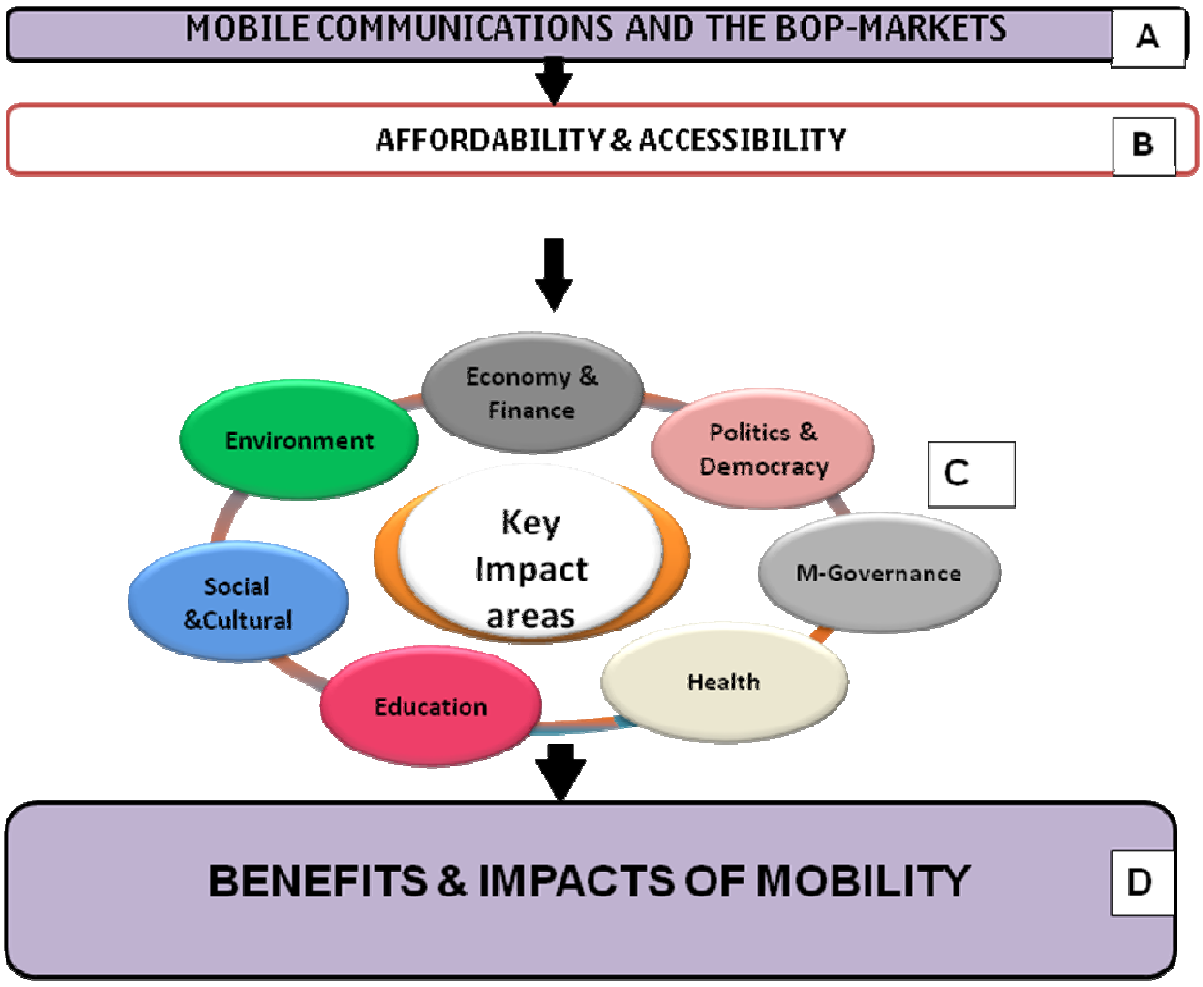
Both the digital divide and affordability aspect are very much linked to public sector initiatives and regulations e.g. concerning taxation. If the telecom industry services are highly taxed, there is a direct link to affordability, accessibility and equality, which in turn is a factor in determining who will be able to be part of today's digital society. Overcoming the digital divide requires the collaborative involvement of the key stakeholders – namely the public sector, the private sector, consumers and civil society – to create a "virtuous circle" (Figure 10), of mutual benefits and win-win situation. These four stakeholder groups need to work towards a holistic approach to achieving the universal access to information, with to extending the affordability by reducing the total cost of ownership (TCO; see chapter 4.2) for mobile communications (Expanding Horizons, 2009).

3 Data and the analysis of the study

3.1 The procedure for the study

The basic structure of the framework for the study (Figure 11) derived from the understanding of the phenomenon through the previous literature and research, discussions with experts, advisory work provided by Altura Advisers (see 3.2) and through understanding gained working at Nokia. The procedure for the study gives structure and functions as a map or a tool for the study.

Figure 11 **The framework for the study**



First, the background information (Frame A (Figure 11)) about mobile communications and the BOP markets is described mainly based on secondary information.

Affordability and accessibility are analysed based on both secondary information and discussions with experts (Frame B (Figure 11)). Affordability and accessibility are seen as gatekeepers for possible impacts and benefits. They are seen as conditions that the mobile technology can reach the BOP consumers and actually deliver any impact or benefit.

Frame C (Figure 11) Impacts of mobility are categorised into key impact areas and dimensions. These impacts can be positive, but also negative or unintentional.

Frame D (Figure 11) benefits and impacts of mobility are analysed in detail using the key impact areas and dimensions categorization.

3.2 Operationalisation of the framework

The final framework for key impact areas and dimensions (Figure 12) is further developed from the preliminary framework (Appendix 1) provided by an advisory company Altura Advisers (Simon Commander, Ksenia Kuznetsova & Leonard Waverman). Altura Advisers worked as advisors for Nokia during the months March-May 2010. Their work was to explore impacts of mobility in the specific emerging market countries and to provide an impact matrix. This thesis is a continuation of Altura Adviser's work and reference to their work is done by using a reference Commander et al., 2010, which is their final report.

This thesis was started with Appendix 1 framework and by much iteration brought to the form of framework presented in figure 12. The published literature, new research founding and discussions with experts have formed the final framework for key impact areas and dimensions of mobility (figure 12). Appearance of similar anecdotal stories about dimensions of mobility, e.g. mobiles in electoral oversight found in different parts of the world gave an indication and proof that this dimension should be included in the framework.

Figure 12 framework can be considered as the main hypotheses of the thesis. The aim of this framework is to picture reality, but categorisation is naturally artificial. This framework will also keep on changing as the understanding of the phenomena of benefits of mobility becomes deeper and wider.

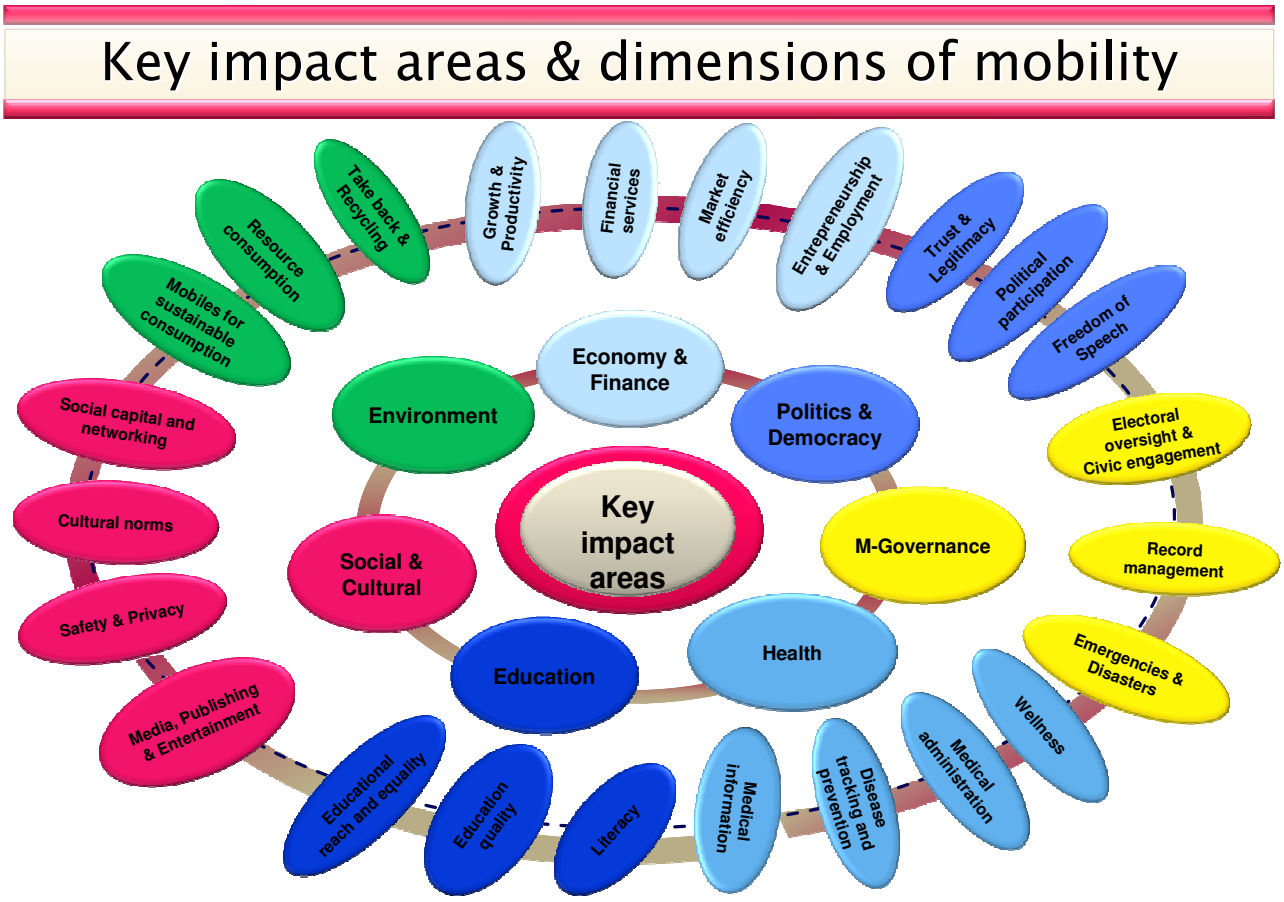
The biggest changes made to the Altura Advisers framework (Appendix 1) were done by separating "Health" and "Education" into their own entities as key impact areas. Also categorisation of the "Politics" and "M-governance" key impact areas were done in a new

way. In the “Economy and Finance” area the “Employment and entrepreneurship” dimension was highlighted as its own entity. In the “Social and Cultural” area “Safety and Privacy” was taken into consideration from the positive but also from the negative perspective. In the “Environmental” area the role of mobiles providing possibilities for more sustainable consumption was added to the framework. It is also important to mention that that in the Environment –key impact area the viewpoint and the level of understanding of external advisors were very different from the standpoint of mobile industry sustainability experts even though the terms used (e.g. resource consumption) were the same.

Changes to the framework were made constantly during the first six months of the research project. Mainly the changes were made by deleting dimensions from the framework or renaming them. For example when comparing the final version (Figure 12) to the version dated late May 2010 (see appendix 2), the biggest changes were made to key impact areas “Education” and “Social & Cultural” where in both areas two dimensions were taken away. In key impact area “Education”: “New innovative ways of learning” and “Educational content delivery” and in the key impact area “Social & Cultural”: “Work-Life balance” and “Gender issues”. This was because of better categorisation for the dimensions were found or these dimensions were taken into consideration within other dimensions. It wasn’t possible to look at these dimensions separately but instead embedded in other dimensions.

An example of renaming the dimension is seen in the key impact area of “Politics & Democracy”, where “Political activism” was renamed by “Political Participation”. This was done because activism can be seen in a negative sense and the meaning was to look at the impact of mobile phones in political participation in a broader scale, also from the positive side.

Figure 12 **Framework for key impact areas and dimensions of mobility**



Framework consists of seven key impact areas: Economy & Finance, Politics & Democracy, Mobile-Governance, Health, Education, Social & Cultural and Environment. The key impact areas are further divided into different dimensions seen above (Figure 12). The main definer going through the dimensions (the outer circle) is the question:

"What types of benefits can mobile technology provide at the BOP markets?"

This question is asked every time moving from the key impact areas (inner circle) to the dimensions (the outer circle). The structure of the chapters follows the pattern that: first the key impact area is introduced and then the area is being analysed through dimensions in more detail by answering the question: What types of benefits can mobile technology provide at the BOP markets?

Framework for key impact areas and dimensions of mobility in list format:

Impacts of mobility – Economy & Finance

1. Growth & Productivity
2. Financial services: Mobile banking
3. Market efficiency
4. Entrepreneurship & Employment

Impacts of mobility – Politics & Democracy

1. Trust & Legitimacy
2. Political participation
3. Freedom of speech

Impacts of mobility – M-Governance

1. Electoral oversight & Civic engagement
2. Record management
3. Emergencies & Disasters

Impacts of mobility – Health

1. Wellness
2. Medical administration
3. Disease tracking and prevention
4. Medical information

Impacts of mobility – Education

1. Literacy
2. Educational quality
3. Educational reach and equality

Impacts of mobility – Social & Cultural

1. Media, Publishing & Entertainment
2. Safety & Privacy
3. Cultural norms
4. Social capital and networking

Impacts of mobility – Environment

1. Mobiles for sustainable consumption
2. Resource consumption
3. Take back & Recycling

3.3 The methodology, Qualitative Research & journalistic methodology

Auerbach and Silverstein (2003, p. 16) define qualitative research as follows: "Qualitative research is research that involves analyzing and interpreting texts and interviews in order to discover meaningful patterns descriptive of a particular phenomenon". Analytic induction (Orlikowski et al., 1991) is present in qualitative studies where continuous iterative discussion is done between empirical data and existing literature and research discussion. This is very much the case in this thesis, where research and expert discussions are constantly being reflected to picture the reality.

Instead of testing a hypothesis, the objective of qualitative research is to generate hypotheses. It is also a more appropriate method when the goal is to obtain subjective information of a phenomenon, instead of providing numerical evidence for a pre-existent hypothesis, as is the case with quantitative research. As mentioned earlier the goal of this thesis was to generate the framework of key impact areas and dimensions and so to say generate hypotheses (Figure 12).

Several researchers have criticised the "either-or" of qualitative vs. quantitative research, and a continuum between these two methods has been noted (Guba and Lincoln; Alasuutari etc. in Metsämuuronen, 2000). The differences between the two methods are numerous, though, which is why Metsämuuronen (2000) suggests choosing only one as the main research method. Already, this definition provides the basis for choosing a qualitative research as the main approach for this thesis.

There has been growing interest of deploying journalistic methodology to the academic research (Duffield, 2009, p. 2). Journalism requires making sense of diverse issues using for the most part qualitative and interpretive methods including observation, review of surveys and research, contents review of mass media publications and interviews (Duffield, 2009, p. 21).

This thesis has journalistic properties and elements as the aim has been to picture the benefits and impacts of mobility in a wider scale looking at the phenomena from the different angles using different sources. This has been done very much by using the journalistic methodology mentioned above such as discussions with various experts and gathering wide amount of content, such as surveys, research, blogs and combining this material to build a holistic framework of the phenomenon of the benefits and impacts of mobility.

3.4 Primary data of the study: discussions with mobile experts

The primary data of the study consist of investigating the benefits and impacts of mobility through discussions with various experts from Nokia as well as researchers and active players mainly in the field of Mobiles for Development (M4D) and Information and Communication Technology for development (ICT4D). Two conferences in the field of ICT4D and M4D were also attended in autumn 2010 in order meet as many M4D experts as possible at the same time.

In total, discussions with 23 Nokia's internal experts and 20 external experts were conducted. In addition, various other discussions and meetings with experts in the field of impacts of mobility were held between March 2010 and March 2011. Weekly telephone meetings with the advisory company Altura Advisers were held during the months of March, April and May 2010. Furthermore, two face to face workshops between Nokia and Altura Advisers were organised in April and May 2010 in London.

Due to the fact that the author herself works in the mobile technology industry, the thesis can be considered to represent the view from the mobile technology industry's point of view, bringing an insider's perspective to the discussion.

Table 2 **Number of discussions with experts in the field of Impacts of mobility**

	Nokia & NSN Internal experts	External experts	TOTAL
Economy & Finance	2	6	**8**
Politics & Democracy	3	1	**4**
M-Governance	2	1	**3**
Health	2	2	**4**
Education	3	1	**4**
Social &Cultural	1	2	**3**
Environment	6	3	**9**
Affordability	3	2	**5**
Accessibility	1	2	**3**
Total	**23**	**20**	**43**

Note: names and/or positions of the experts listed in the reference list.

The data was collected during the period between March 2010 and March 2011. Open unstructured discussion was chosen due to the exploratory nature of the study. The framework of key impact areas and the dimensions (Figure 12 & Appendix 1 & 2) provided a framework

for the discussions. The expert discussions lasted approximately from one to two hours and notes were taken during discussions. As the discussions weren't interviews, no recordings were made. Using informal and semi-structured model for discussions, it is believed that the knowledge captured is very different to using formal interview methods. Only the rough framework of key impact areas and dimensions of mobility (Figure 12 & Appendix 1 & 2) guided the topics of the discussions.

3.5 Secondary data of the study

The secondary data of this study was gathered from literature, industry and academic journals, market intelligence reports, news articles, various Internet sources and blogs. Table 4 lists the main sources of primary and secondary information:

Table 3 **The main sources of information**

Information to be obtained	Secondary sources:	Primary sources:
Affordability & accessibility	• Total cost of ownership-data (Nokia) • Nokia Company database • Connectivity Scorecard (NSN) • BOP literature • Industry and academic journals • Market intelligence reports	• Discussions with Nokia & NSN internals experts and external experts
Economic-Finance	• Benefits and impacts of mobility case studies • Industry and academic journals • Internet & Blogs • Company database •	• Discussions with Nokia & NSN internals experts and external experts
Politics & Democracy	• Benefits and impacts of mobility case studies • Industry and academic journals • Internet & Blogs • Company database	• Discussions with Nokia & NSN internals experts and external experts
M-Governance	• Benefits and impacts of mobility case studies • Industry and academic journals • Internet & Blogs	• Discussions with Nokia & NSN internals experts and external experts
Health	• Benefits and impacts of mobility case studies • Industry and academic journals • Internet & Blogs • Company database	• Discussions with Nokia & NSN internals experts and external experts
Education	• Benefits and impacts of mobility case studies • Industry and academic journals • Internet & Blogs • Company database	• Discussions with Nokia & NSN internals experts and external experts
Social & Cultural	• Benefits and impacts of mobility case studies • Industry and academic journals • Internet & Blogs • Company database	• Discussions with Nokia & NSN internals experts and external experts
Environment	• Benefits and impacts of mobility case studies • Industry and academic journals • Internet & Blogs • Company database	• Discussions with Nokia & NSN internals experts and external experts

Note: more detailed information in the reference list.

3.6 Analysis of the data

Using open unstructured discussions sets limits for the methods of analysis. The frame of the analysis is presented in Figure 13. Each block describes a set of variables. The arrows between the blocks describe the relationship between two sets of variables. Tables 4 and 5 show the purpose and the methods of analysis.

Figure 13 **The framework for data analysis**

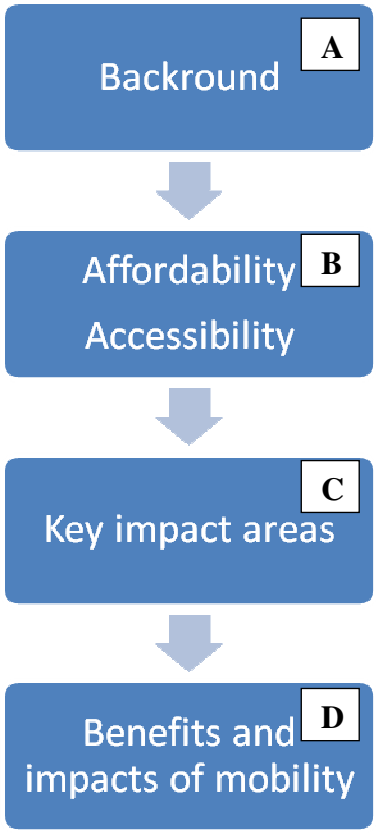


Table 4 **Description of variables and the method of analysis**

DESCRIPTION OF VARIABLES		
Letter	**Purpose of Analysis**	**Method of analysis**
A	Description of background	Qualitative
B	Description of affordability & accessibility	Qualitative
C	Description of key impact areas	Qualitative
D	Description of analysis	Qualitative

Table 5 **Description of connections between variables and the methods of analysis**

DESCRIPTION BETWEEN VARIABLES		
Number	**Purpose of Analysis**	**Method of analysis**
1	Connection between background and mediating variables	Qualitative
2	Connection between mediating variables	Qualitative
3	Connection between background and mediating variables and impacts of mobility	Qualitative

4 Affordability and accessibility measures

4.1 Accessibility measured by Connectivity Scorecard (CSC)

The Connectivity Scorecard is one existing tool for tracking progress in ICT accessibility.

Raising a country's connectivity score takes a united effort between the different players, particularly through public-private partnerships. Connectivity Scorecard (figure 14) is a global ICT index ranking 50 countries not only on their deployment of ICT infrastructure but also on measuring the extent to which governments, businesses and consumers make use of connectivity technologies to enhance social and economic prosperity, the so-called "useful connectivity". The architect of the scorecard is Professor Leonard Waverman, Dean of the Haskayne School of Business at the University of Calgary. CSC is sponsored by Nokia Siemens Networks.

The scope of CSC research is being extended recently, with additional sets of measures such as literacy and women's access to ICT. The study also uses country specific economic data to weigh the findings in the three sectors (government, business and consumers). Countries are ranked into two classifications: "innovation driven economies" and "resource and efficiency driven economies" (BOP markets). What should be highlighted is a finding that economic growth of connectivity scores for "innovation driven economies" depends on innovative ways of using connectivity, whereas for "resource and efficiency driven economies", social development is key in getting the best return on ICT investments (Connectivity Scorecard, 2011 & Expanding Horizons, 2009, p. 31).

Table 6 **Connectivity Scorecard 2011 — resource and efficiency-driven countries**

Rank	Country	Final Score
1	Malaysia	6.61
2	Chile	6.21
3	Russia	5.68
4	Turkey	5.51
5	Argentina	5.46
6	Brazil	5.14
7	Mexico	4.87
8	Ukraine	4.81
9	South Africa	4.68
10	Colombia	4.06
11	Thailand	3.68
12	Tunisia	2.79
13	Vietnam	2.73
14	China	2.72
15	Iran	2.41
16	Philippines	2.15
17	Syria	2.11
18	Indonesia	2.01
19	Sri Lanka	2.01
20	Egypt	1.89
21	India	1.25
22	Pakistan	1.14
23	Nigeria	1.09
24	Kenya	0.95
25	Bangladesh	0.90

Source: Connectivity Scorecard, 2011

BOP markets are mainly represented in the category of "resource and efficiency-driven countries" Malaysia keeps the top for a 4th year in a row. South Africa fell back several places, from number 2 in 2010 to 9th this year. In general, the scores correlate very well with per capita GDP and other measures of overall economic development. What is interesting is that despite the growth prospects and the fact that India and China have the largest number of mobile subscriptions in the world, they are relatively weak performers in Connectivity Scorecard ranking: China 14. and India 21. (*table 6*).

China is well ahead of India, especially in measures of consumer infrastructure deployment (mobile penetration, broadband penetration). However, China has a long way to go before it

reaches the levels of the top five group, especially in terms of overall business investment in ICT. India lags behind in almost all aspects of the CSC. This reflects the fact that these countries are still relatively poor (at least on a nominal per capita GDP basis) and that ICT diffusion is still very uneven within these countries. That said, there is a very substantial gap between China and India in terms of ICT adoption and usage (Connectivity Scorecard, 2011).

This is still a surprising result when considering the trend of outsourcing call centres and IT service desk especially to India. And the fact that China and India have been putting resources into education over the past couple of decades. China produces 75 000 graduates with higher degrees in engineering or computer science and India 60 000 every year (The Economist, 2010, p. 2).

4.2 Shared use/Access models to widen accessibility

In South Africa more than half the traffic on Vodacom's mobile network in 2004 came not from its 8 million subscribers but from 4,400 entrepreneur-owned phone shops where customers rent access to phones by minute (Hammond et al., 2007).

Shared access, in which an entrepreneur with a phone provides pay-per-use access to a community—has extended the social and economic impact of mobile phones beyond the subscriber base. Affordability and accessibility usually go hand in hand. Sharing a phone certainly makes them more affordable.

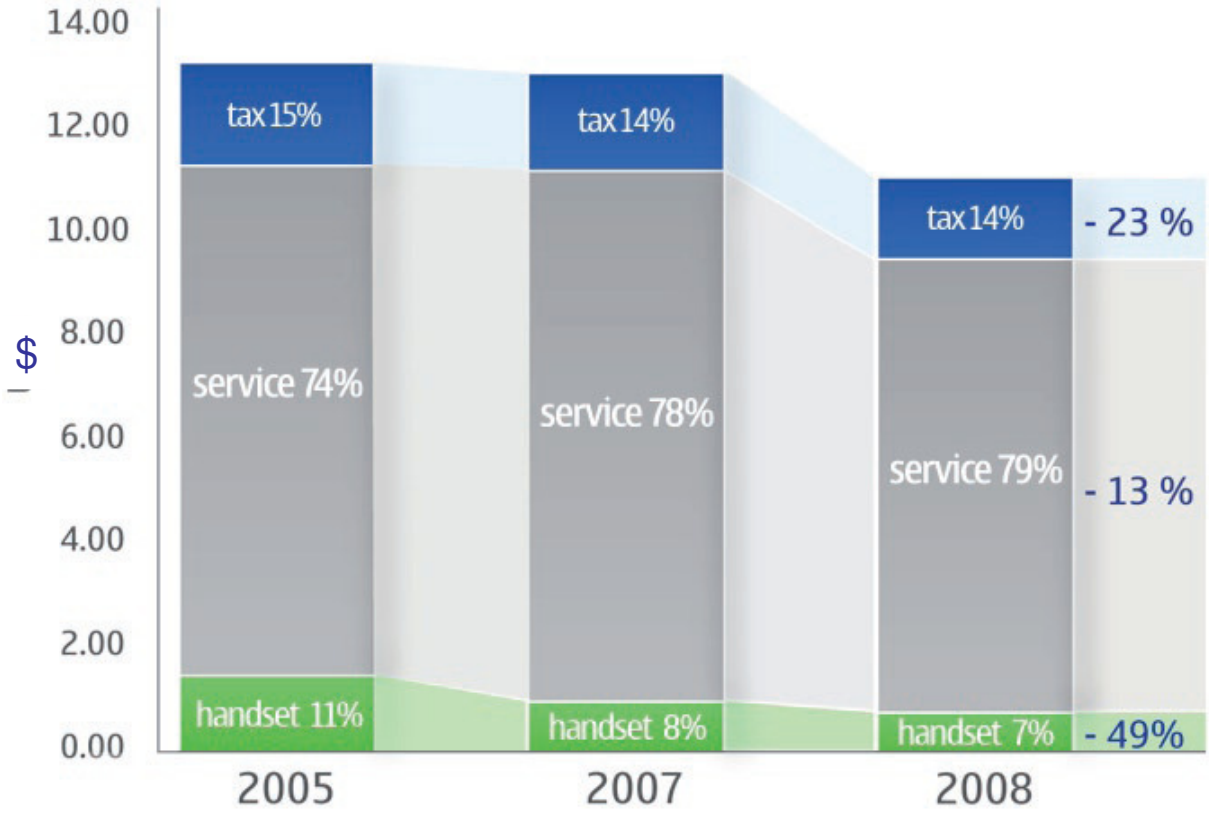
Researcher Sirpa Tenhunen discovered that in rural India privately owned mobile phones were shared much like public phone for a fee (Tenhunen, 2008, p. 520). What the author learned in Uganda was that people actually carried phones with them so that people could reach them, but they made calls from the public phones, because it was less expensive.

4.3 Affordability measured by total cost of ownership — monthly target of $5 enabling use of mobile communications

Total cost of ownership (TCO) is defined as how much of a consumer's income is required to enable them to be connected. Nokia research reveals that a TCO of $5 or less per month is needed to enable the majority of the world's low income consumers to afford the use of mobile communications.

The components of TCO concerning the mobiles are the handset price, service fee, and taxes. The answer of affordability lies in a favourable regulatory environment coupled with innovative operator strategies and business models. In sub-Saharan Africa, 24 governments levy specific luxury taxes on mobile phones and eight governments levy luxury taxes on mobile use (Deloitte and GSMA, 2007, pp. 48-49). Not only do such levies damage the national economic growth potential that widespread mobile ownership can bring, but they are also counter-productive. In the medium to long-term, moderation of taxes makes mobile communications more affordable and boosts subscriber numbers increasing the overall tax yield.

Figure 14 **The main components of total cost of ownership**



Source: Nokia, 2009

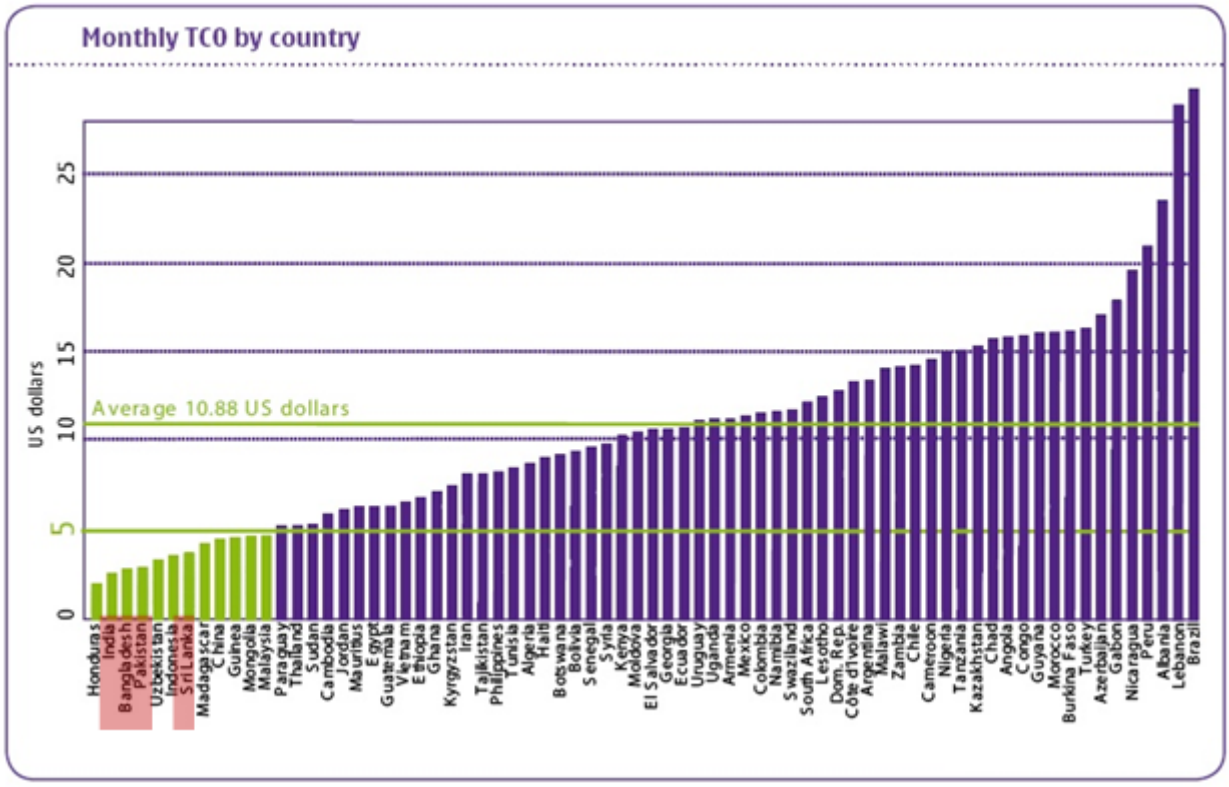
The main three components of total cost of ownership include (Figure 14):

1. Taxes: Taxes to handset and service, including VAT, sales tax, extra telecom taxes and custom duties.
2. Service: OECD low-cost service basket for a pre-paid mobile subscriber, including 30 calls and 33 SMS.
3. Handset: Lowest cost globally available Nokia handset

On average, handset costs account for 7% of the TCO, service fees for 79% and taxes 14%, with recent developments seeing the handset component dropping by 49%. The largest component of TCO, the service fee, has also declined, by 13% from 2007 to 2008 (Figure 14).

According to TCO related research findings lower-income people are willing to spend around maximum 10% of their income (USD 50-100) on mobile telecommunications per month, thus the $5 target. The average cost of owning and using the mobile phone across the 77 studied countries was $10.88 a month in 2009 (Figure 16) down from $13.16 in 2007. There is no more recent data available. This is a huge step compared to the drop in TCO of just 1% from 2005 to 2007 (Expanding Horizons, 2009).

Figure 15 **Total cost of mobile ownership in 77 emerging economies**



Source: Nokia, 2009.

Figure 15 shows that in 2009 twelve countries, Honduras, India, Bangladesh, Pakistan, Uzbekistan, Indonesia, Sri Lanka, Madagascar, China, Guinea, Mongolia and Malaysia, reached the target of TCO less than $5 monthly. In addition half of the studied countries rank at or below the average of $10.88. In 2007 only four South-Asian countries: Sri Lanka, India, Pakistan and Bangladesh ranked as high TCO performers.

What does this mean in practice? Out of two people with the same income level in two different countries, one can comfortably buy a mobile subscription within his/her budget

(Case e.g. Honduras & India) while the other finds mobile communications financially inaccessible and well beyond his reach (e.g. Case Lebanon & Brazil).

The large differences between markets in TCO can be explained through many interconnected reasons. According Sanna Eskelinen, Nokia Senior Manager of Corporate Social Investment, some of the differences include: *"The level of competition in the market, the availability of service models encouraging or discouraging mobile data use, the level of taxation of handsets and services, the presence of policies encouraging a fair, transparent, and pro-competition market environment as well as the level of awareness, interest and motivation of the demand"* (Private Discussion).

4.4 Challenge of irregular and unpredictable income to affordability

As BOP consumers have low disposable incomes products and services should match the cash-flow of customers.

The buying behaviour of the BOP consumers is different from developed markets as income is irregular and unpredictable, both in amount and frequency. The specific characteristics are, for example, paying in advance, and buying in sachets or single portions. These criteria among others also set conditions for the products and pricing (Linna, 2009, pp. 12-13).

Many of the BOP consumers frequently receive their income on a daily rather than on a weekly or monthly basis. Low-priced micro packs for daily necessities or sachet pricing for services such in mobile communications is an answer. As the Smart Communications example in the Philippines has shown, with sachet pricing it is possible for the profit level of the company to exceed that made on pre-paid cards (Anderson, 2006, pp. 4-5).

To reach the scale, the mobile telecom operators should strive to offer pricing packages that the BOP consumers can afford. Innovative pricing models already exist offering affordability and choice, even for very low-income customers, e.g. cheap handsets, micro prepayments and top-up cards. Innovative ways of mobile phone access, which allow the sharing of phones through SIM cards and payments for air time through micro-prepayment, promote even more rapid adoption by the poor (Bhavnani et al., 2008, p. 5).

5 Key impact areas and dimensions of mobility

In the chapter 5 the benefits and impacts of mobility are analysed in detail using the key impact areas and dimensions framework (Figure 12), which consists of seven key impact areas: Economy & Finance, Politics & Democracy, Mobile-Governance, Health, Education, Social & Cultural and Environment. The key impact areas are further divided into different dimensions. The main definer going through the dimensions is the question:

"What types of benefits can mobile technology provide at the BOP markets?"

5.1 Economy & Finance

"The reason for a strong uptake of services such as mobile payments, person-to-person funds-transfer (P2P) and agricultural information services in emerging markets is the big impact of these services on the daily lives of the local population. They are contributing to the social and economic development of the population in these markets" (Informa Telecoms & Media 2010a, p. 2).

Does the spread of mobile phones boost economic growth and development? In the past years the anecdotal evidence has been backed up by quantitative studies measuring the economic impact of mobile phones (see Zhen-Wei Qiang, 2009; Deloitte, 2007; Waverman et al., 2005). Critics say that it is difficult to tell whether mobile phones are promoting growth, or whether growth promotes the spread of mobile phones as more people become able to afford them (The Economist, 2009, p. 4). Or are these two variables totally independent and don't actually have any causality?

From the historical perspective, one analysis suggested that a third of the economic growth in the Organisation for Economic Cooperation and Development (OECD) countries between 1970 and 1990 was due to access to fixed-line telecoms networks alone, which lowered transaction costs and helped companies to access new markets (Smart 2020, 2010, 1/13). Globally, the ICT sector contributed 16% of GDP growth from 2002 to 2007 (Vetter & Creech, 2008, 18). Various researches (e.g. Aker, 2008) point out that improved communication has helped increase wealth by driving down commodity prices, coordinating markets and improving business efficiency (Eggleston et al., 2002). A frequently sited study in Kerala, India showed that the introduction of mobile phones contributed on average to an 8% rise in fishermen's profits and a 4% fall in consumer prices (Jensen, 2007, p. 883).

Emerging markets are displaying very strong rates of growth. E.g. in China, Brazil and India: the expected growth in private consumption was around 6-11% in 2010 (The Economist Intelligence Unit, 2010). However, 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 for market efficiency. For example, the first fundamental theorem of welfare economics (i.e., competitive equilibrium are Pareto efficient) and the law of one price (i.e., the price of a good product 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, p. 879).

Access to information is essential for functioning of knowledge based economy and digital society. The mobile Internet can be very powerful medium as the next billion new users start using it. By 2013 mobile broadband is expected to represent 65 % of the total broadband market, driven partly by growing demand in emerging markets (Informa Telecoms & Media, 2009, p. 2). As disposable income of many BOP consumers is expected to grow, the consumer spending on communications is expected to rise. Food dominates BOP household budgets, but as incomes rise, the share spends for telecommunications and e.g. transportation grows rapidly (Hammond et al., 2007, 14).

Banking and financing will also become very much mobile on a global scale. Mobile phones can cut the cost of transactions, making widespread microfinance more efficient. A CGAP study of financial services for the poor found that mobile phone banking was potentially six times cheaper for routine banking transactions (Global Envision Blog, 2007). Microfinance spans a range of financial instruments including (micro) credit, savings, insurance, mortgages, and retirement plans, all of which are denominated in small amounts, making them accessible to individuals previously being restricted from formal means of borrowing and saving. One of the major innovations of microfinance is the reliance on group lending practices. Studies generally find that repayment rates are high and could be a result of the social capital tied in the system (Khavul, 2010, p. 63; Gokhale, 2009; Khandker, 1998 and 2005). Also a simple benefit of mobiles, from a user's point of view, is easier financial planning of phone bills. Controlling the size of phone bills, when using a landline phone, was much more difficult.

In the next sub-chapters a more detailed analysis is provided about what types of benefits can mobile technology provide concerning the "Growth & productivity", "Financial services", "Market efficiency" and "Entrepreneurship & Employment"?

WHAT TYPES OF BENEFITS CAN MOBILE TECHNOLOGY PROVIDE IN THE AREA OF ECONOMY AND FINANCE AT THE BOP MARKETS?

5.1.1 Growth & Productivity

Let us first examine the evidence that the use of mobile phones boosts the growth of GDP. In a much cited study, Leonard Waverman et al. (2005) found that in a typical developing country, an increase of 10 mobile phones per 100 people boosts GDP growth by 0.59%. Deloitte (2007) estimated that with every 10% increase in mobile penetration, the GDP growth increases by 1.2%. The most recent macroeconomic study, carried out by Christine Zhen-Wei Qiang (2009, p. 8) from the World Bank, found that a 10% increase in mobile penetration in a developing country increased growth in GDP per person by 0.8%. According to Zhen-Wei Qiang's research (Figure 9), mobile phones were more effective at promoting growth than landline phones, but less effective than Internet access or broadband.

Studies concerning Latin America and Africa have also found that the growth of the mobile industry has led to increases in the flow of foreign direct investment (FDI) and that the FDI tends to be higher in countries where the mobile penetration is higher (Lewin & Sweet, 2005).

5.1.2 Financial services: Mobile banking

According to an estimate by CGAP, by 2012, some 1.7 billion people will have a mobile phone but no bank account, and 20% of them will be using mobile money (CGAP, 2009, p. 1).

Since there are many more mobile phones and sellers of mobile airtime than there are cash machines and bank branches, mobile money is well placed to bring financial services within the reach of billions of unbanked people across the developing world (The Economist, 2009, p. 12). About 120 mobile money services were launched in developing countries in 2009, more than double the number in 2008. According to CGAP estimates as many as 364 million low income, unbanked people will use mobile money in 2012, generating $7.8 billion in new revenues for the mobile money industry via transaction fees, improved loyalty, and more cost efficient airtime distribution (CGAP, 2009, p. 1).

Mobile payment systems allow real money, rather than just airtime, to be transferred from one user to another by phone. It is possible to pay money into the system and withdraw money by

visiting an agent. It is also possible to send money to other people, who will receive a text message containing a special code that can be taken to an agent to withdraw cash.

The biggest success stories in this field so far have been MPESA in Kenya by Safaricom. Since becoming so wildly popular, it is used to pay for nearly everything from school fees to taxis. Taxi drivers like it because it means they are carrying less cash around (The Economist, 2009). In general, as cash money can be a burden for the people in the BOP markets, making them vulnerable to crime, mobile banking can bring greater personal and financial security (Hammond et al., 2007, p. 97).

Mobile Money can also assist on development of fragile states. In 2008, Roshan partnered with Vodafone to launch M-Paisa mobile money service in Afghanistan. It has been used e.g. for salary disbursement for employees in the Police Force (TechCrunch blog, 2010). Even more significantly, it has served as a catalyst for Afghanistan's economy by facilitating business transactions, loan repayments, and the movement of money nationwide (Satchu, 2009).

Berg Insight (2010) forecasts that mobile banking will grow even more from 55 million users in 2009 to 894 million users in 2015. For BOP customers, mobile technology in financial services can address four important benefits: convenience, accessibility, security, and transferability (Hammond et al., 2007, p. 101). Establishing a banking relationship gives people a formal identity they have often lacked before, contributing to the process of political and social inclusion and emancipation crucial for empowerment.

It seems that mobile banking is bringing economical but also social benefits as it is easier, quicker and cheaper to transfer money, commissions are lower, and recipients no longer have to pay for transport to towns to make withdrawals. According to ethnographer Olga Morawczynski from Grameen Foundation, as rural households have adopted mobile money, their income has increased even by 5-30% (The Economist, 2009, p. 12).

Mobile-banking is typically more successful in areas with weak financial infrastructure (Commander et al., 2010). For example, mobile banking is successful in developing economies such as Kenya, the Philippines and Afghanistan precisely because of the lack of any other infrastructure supporting financial services (The Economist Intelligence Unit, 2007).

According to the OECD and Infodev[6] (2009), three key barriers prevent the poor from making use of mobile financial services even when available: 1) lack of financial literacy, 2) lack of trusted intermediaries and 3) *affordability*. To be able to address these barriers would, again, require coherence across a set of policy areas including taxation, telecommunications policy, education, and financial regulation.

Some mobile money schemes also allow for international remittances. Remittances play an important role in the development of BOP markets and can be seen as an expansion of the informal financial sector (Commander et al., 2010). According to World Bank officially recorded remittance flows to developing countries in 2008 reached $338 billion. The money received is an important source of family and national income in many developing countries (The World Bank, 2009, p. 1). In Kenya, 40% of all adults use the M-PESA service with a dramatic increase in national remittances; from 17% in 2006 to 52% in 2009 (GSMA, 2009b, p. 3).

BOP expert Paula Linna raises one of the privacy challenges concerning the mobile payments: *"Especially in Kenya, in the beginning the SIM registration was done anonymously concerning the popular mobile payment service M-PESA. This led to a situation that it was easy to use mobile phones for criminal purposes. Later on, registration has become mandatory* (Private Discussion).

In India also Nokia also has rolled its own mobile banking service called *Nokia Money*, which allows to check balance, manage expenses and payments and add credit to your mobile account.

5.1.3 Market efficiency

The use of mobile phones may correct market inefficiencies by enabling users to access information they otherwise would have missed out.

Mobile services about market information prevent exploitation by middlemen, reduce information gaps, save costs and time e.g. concerning travelling as well as strengthen access of service providers to rural people (Bhavnani et al., 2008).

[6] infoDev is a global partnership program in the World Bank Group of international development agencies that helps donors and developing countries use innovation and information and communication technologies (ICT) to achieve economic growth, sustainable development and poverty reduction.

A study, similar to the already mentioned Kerala study by Jensen, was conducted in 2008 in Niger by Jenny Aker. The evidence showed that cell phones reduce grain price dispersion across markets by a minimum of 6.4% and reduce intra-annual price variation by 10% (Aker, 2010, pp. 54-55). Similar findings were made in Senegal in 2008; in Acadia II project, which aims at using ICTs to increase income for farmers and fishermen, it was found that fruit and vegetable farmers were able to increase prices by as high as over 50% by using a mobile based market price system. Secondly, the project found the fishermen were able to reduce the amount of spoiled fish while in search for a market buyer (IDRC, 2008, 11).

Crops can also be insured using mobile phones, which decreases transaction costs and increases purchase of higher quality seed. Most known example is again M-PESA's crop insurance scheme, called "Kilimo Salama", safe farming in Kiswahili (The World Bank Blog, 2010).

Aker (2010, pp. 54-55) also found that the reduction in price dispersion only became significant at a point when more market pairs got mobile phone network coverage. This suggests that there are significant network effects across markets. Besides smoother price information, Aker found that having a mobile phone provided more business opportunities in terms of improved business contacts for entrepreneurs, better weather and market information for farmers and greater sales for small businessmen. Ability to conduct business via a "mobile office" improved productivity (Aker, 2008, p. 1).

Similar founding was made by researcher Sirpa Tenhunen in rural India. Farmers she surveyed were increasingly using phones to obtain information on market prices. Also agricultural produce was possible to be sold via mobile phones as previously deals were closed by signing a written contract well in advance of the products' delivery. Now sellers were able to continue negotiating with various buyers until it was time to deliver the products. The prices were settled by phone at the very last moment, which decreased the middlemen's profit and benefited the farmers (Tenhunen, 2008 and private discussion).

Nokia offers Life Tools (NLT) service for people in India, China, Indonesia and Nigeria. NLT aims to enhance market efficiency by enabling farmers to make better informed decisions by providing tailored agricultural information according to the cropping cycles and geographical location as well as latest agricultural techniques, and related agricultural news. The service also includes regular updates of local market prices of seeds, fertilisers, and pesticides, which help the farmer to make better choices and possibly to earn more.

5.1.4 Entrepreneurship & Employment

There is evidence that mobile industry generates employment.

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 (2007) discovered that, mobile sector employment in 2007 was significant in the emerging markets, although the mobile operators themselves only create limited employment (Bhavnani et al., 2008).

Mobile phone industry has also been boosting entrepreneurship in the BOP markets by providing small entrepreneurs an easy and affordable tool to sell and deliver their services. Mobiles may reduce the cost of running a business - and may even enable a user to start one (Bhavnani et al., 2008, 16). The most famous example of this model is Grameen Village Phone, formed originally in Bangladesh. A similar franchise model is found in the phone shops of e.g. South Africa, where tens of thousands of locations provide telecommunications services. Developed originally to fulfil some of South Africa's universal access provisions, these franchises have proved extremely important to the townships and rural areas in the nation (Donner, 2005).

Researcher Sirpa Tenhunen's observations in India backs up the evidence mobiles can bring for small-scale businesses. She reports that due to mobile phones, micro entrepreneurs were able to keep in touch with their customers, even when they were on the road or were transporting goods. Time saving was one the major economic benefits of mobiles as people didn't need to be absent from work or travel to meet people in order to stay connected. This is especially important for daily labourers, for whom having to miss a day from work may mean not being able to feed their family that day (Tenhunen 2008, 528). One study surveyed 600 workers in China, who travelled for their jobs (e.g. plumbers, salespeople and taxi drivers) that mobile phones offered itinerant workers time savings of 6%, bringing a productivity gain worth some $33 billion in 2005 (Enriquez et al., 2007).

Mobile phones are not the only means of assisting in providing employment and entrepreneurship opportunities. It is more the rich ecosystem developed around the mobile industry. Besides selling of airtime, handsets and SIM cards, the role of mobile service and applications developers is growing as the demand in the market has grown tremendously. There are great business opportunities to answer these demands. According to Jussi

Hinkkanen, Head of Government Relations for Nokia operations in Middle East and Africa: "*Mobile revolution has opened up completely new entrepreneurial opportunities for e.g. local software developers in Africa. Without local, highly contextual content, services are not relevant for local consumers. And this is where there is a major opportunity for growth. Additionally, in the past, local software developers seldom had access to regional, continental or international markets. Now due to mobile based distribution platforms physical distances have become secondary, meaning that African entrepreneurs can compete head to head on the global markets"*(Private discussion).

Linna and Richter (2011) have researched mobile industry in East-Africa, where particularly the field of mobile applications is booming. *According to Linna "It is interesting to see what kind of impact this will have for the whole society. Mobile industry being so global, this kind of new "tech-entrepreneurship" gives access to global markets for the local developers and entrepreneurs"(Private discussion).*

Matti Tedre, a professor of computer science in University of Eastern Finland and Tumaini University in Tanzania, takes more critical approach towards the employment and entrepreneurship opportunities that mobile phones may bring: *"In most types of businesses, mobile phones do not readily create new income opportunities but just redistribute the existing economy along a new digital divide. Take plumbing, for instance: The introduction of mobile technology will make it easier to reach those plumbers who have a mobile phone, as compared to those without a mobile phone. The phone-owning plumbers benefit but the ones who do not have a phone lose business opportunities. All in all, the introduction of mobile phones does not change the actual amount of plumbing work that needs to be done in a region, nor do they increase the amount of money that can be gained from plumbing--but the use of mobile phones re-distributes the existing jobs in a new way. Mobiles can also play a critical role in employment search" (Private discussion).*

This is very much linked to the network effect that mobile phones provide: Mobiles become more and more valuable and important to their users as an ever increasing number of people use them. At the same time the negative effect of staying unconnected becomes wider.

5.2 Politics & Democracy

The fight against corruption has benefited from ICT. The use of mobile devices, allowing for interaction and access to the Internet even in regions that are less developed in terms of infrastructure, will further lower the barrier for online engagement (Transparency International, 2009).

Fostering greater participation is the key to bridging the digital divide. Technology is changing how people get information, offering a powerful medium especially in countries where information is controlled or where poor or damaged infrastructure limits communication (The Guardian, 2010a). Mobile communication technology is also shifting the focus from place-to-place towards person-to-person connectivity as computers and fixed line telephones are traditionally tied to a fixed location; mobile telephones are not (Miard, 2009).

Mobile phones have begun to be extensively used in both information provision and organisational mobilisation. For instance, text messaging has become a popular tool for political organisers around the world. Uptake of mobile technology for political activism has the potential to increase both trust and transparency in societies, especially in developing nations, where other forms of information technologies (e.g. PCs) are limited.

A recent example of using mobiles phones in political activism comes from Egypt in January 2011 and resulted suspending of mobile communications totally by government order (The Guardian News Blog, 2011). A negative impact of mobile communications is seen in a possibility to tap calls with localisation data. With today‘s technology, it is possible to locate the position of a mobile phone even when the handset is not being used (Miard, 2009, p. 10). Also mobiles have been used in war for unfavourable purposes: A recent WIKILEAKS document reveals that Iraqi rebels favoured Nokia N-95 smartphones with GPS feature and detailed map software to pinpoint bombing targets (Helsingin Sanomat, 2011).

In the next sub-chapters more detailed analysis is provided about what types of benefits can mobile technology provide concerning the “Trust & legitimacy”, “Political participation” and “Freedom of speech”?

WHAT TYPES OF BENEFITS CAN MOBILE TECHNOLOGY PROVIDE IN THE AREA OF POLITICS AND DEMOCRACY AT THE BOP MARKETS?

5.2.1 Trust & Legitimacy

Easing and improving the access to information services via affordable mobile devices can foster democracy and transparency. According to Jussi Hinkkanen, Head of Government Relations for Nokia operations in Middle East and Africa: *"Open access to information levels out information disparity, empowering citizens to themselves judge whether politicians, public officials, private enterprises and their compatriots are communicating a truthful picture of the reality. This has huge importance in building trust and accountability in the society and in stimulating collaboration* (Private discussion).

Mobiles enable more direct forms of citizen involvement in addressing public issues. In the January 2010 speech on Internet freedom, U.S. Secretary of State Hillary Clinton stressed that: "Information has never been so free". Even in authoritarian countries, information networks are helping people discover new facts and making governments more accountable". Mobiles also provide an easy medium for feedback (criticism/suggestions/opinions) (Commander et al., 2010). A good example of this comes from India last year: India's Central Bureau of Investigation is reaching out to population with a new way to trap crooked officials by using SMS. The initiative is called "using SMS to Fight Corruption" and the purpose is putting the fear of being caught in the government officials involved in corruption. The SMS campaign is helping to build a database of officials who need to be observed (The Wall Street Journal, 2010).

According World Bank (2004), bribes are paid each year for a total worth of $1,000 billion. However, reporting on bribery is at low levels – only ¼ citizens take any action against corruption possibly due to insufficient or inaccessible complaint mechanisms (Global Corruption Barometer, 2009, p. 21). In a society with a high level of trust, corruption tends to be more efficiency-enhancing (or less harmful to economic growth), whereas in a society that lacks trust, corruption tends to be more predatory (or more harmful to economic growth) (Li & Wu, 2010).

Being wealthy does not ensure high quality governance, just as being an emerging or developing economy does not automatically translate to poor governance. In fact, over 30 developing and emerging economies, including Chile, Botswana, Uruguay, Mauritius, Rwanda and Costa Rica have higher governance scores than industrialized countries such as

Italy (ranked 87 in Corruption Control) or Greece (ranked 82) (The World Bank, 2010). This could be one explanation for the severe financial Crisis of these two countries.

5.2.2 Political participation

Mobile phones have become a key medium for the political mobilisation around the world (Castells et al., 2007). Spontaneous socio-political mobilisations have used mobile communications to enhance autonomy vis-à-vis governments and mainstream media and to multiply the impact of the protests. The use of mobile phones have been significant e.g. in the orange revolution in Ukraine in 2005; in the 2006 revolt in Thailand against intolerable corruption under prime minister Shinawatra; in Nepal in resistance against the police repression of popular protests, which forced free elections and resulted in the end of monarchy in 2007 as well as in Myanmar (Burma) in 2007 where citizen protests were largely reported to the world through photos and videos captured on mobile phones (CBS News, 2007).

Researcher Johan Hellström tells two more examples of using mobile phones to political campaigns and mobilisation: *"The "don't shop" SMS campaign during the Egyptian General Strike on April 6, 2008 (SMS chain letter) and the first"e-revolution" called "People Power 2" in the Philippines that forced Joseph Estrada to resign from the post as the president of the Philippines in 2006 (SMS chain letter)* (Private Discussion).

Anthropologist Sirpa Tenhunen found in rural India that increased connections to the world may slowly introduce changes to village politics, which has traditionally consisted of villagers having to rely on their village leaders in times of crisis. The new mobile networks accentuate the dispersal of power beyond the village, as seeking help from outside the village during conflicts and crises has become easier (Tenhunen, 2008).

5.2.3 Freedom of speech

Mobiles have become an integral part of the mass organizing of protests and demonstration, connecting activists and ordinary people and giving civic voice to individuals by creating channels for organizing, mobilizing, and reporting (Verclas, 2007). According to Anne Larilahti, Head of Sustainability in Nokia Siemens Networks: "*Clearly, communications networks provide benefits to the users. This is the case also in failed or failing states, where it is often the mobile networks that provide the information, the link to the outside world and the channel to express opinions"* (Private Discussion).

The social divide is defined as a gap between the rich and the poor in each nation in the ability to access information. The democratic divide is about using this information and signifies the difference between those who do, and do not use digital resources to engage, mobilise and participate in public life (Quigley, 2008, p. 133). According to Pekka Isosomppi, Nokia Director of Social regulation: *"Mobility horizontalizes communications in a dramatic way, empowering individuals to directly connect with each other, receive, broadcast and share information. This is a big challenge for information and media monopolies and opens up opportunities for new types of political participation and effective democracy (*Private Discussion).

Researcher Johan Hellström highlights a story about using mobiles to drive transparency: *"Radio shows are very popular all over Africa. Call-in radio shows discussing politics is a good example of how mobile phones can make politics and governments more transparent. People tend to find it easier to call a radio show to tell their concerns and report corrupt cases. Radio is considered being more secured than hotlines: the transparency in radio means that others listen and know the source. And if something happens to the caller, people can figure out why. However, if a particular show becomes too popular, oppressive regimes usually step in. In Uganda for example, there was something called" People's forum" ("Kimeza"): a radio show airing political discussions from round table gatherings to which people could call in. When the government realised how popular Kimeza was and what kind of sensitive topics were covered in the discussions, the censor board started to attend the meetings, which led to self censoring of discussions* (Private discussion).

Another good example of driving freedom of speech and transparency is a crowdsourcing platform "Ushahidi", which builds tools for democratising information, increasing transparency and lowering the barriers for individuals to share their stories in Kenya, Ghana, South Africa, Malawi, Mexico, Chile and India. For example, in the Kenyan election 2007 it was used to crowdsource and map incidences of violence (Verclas and Mechael, 2008). Ushahidi allows anyone to distribute data via SMS, email or web and visualise it on a map or timeline.

According UNWATCH Internet censorship is getting more prevalent as more than 40 countries have censored Internet at one time or another (UNWATCH blog, 2010). China's Internet censorship regime provided legal basis for more specific controls over the mobile

phone and SMS. The Chinese government have 2 800 SMS surveillance centres around the country (Castells et al., 2004; Kinkade and Verclas, 2008).

Mobile technology can bring along unintended negative consequences and one example is related to 2009 elections in Iran: Demonstrators who relied on mobile phones to coordinate their protests were tracked down through spy equipment provided by Nokia-Siemens Networks to two Iranian mobile operators. According to Anne Larilahti from Nokia Siemens Networks: *"Unfortunately, sometimes, the mobile network is also used to suppress democracy, for example, by means of censorship and surveillance. The difficulties arise especially clearly in the cases where local law is not in accord with international agreements"* (Private discussion).

Another recent example of restricting freedom of speech comes from Egypt where the protests against ruling president Mubarak ended in the total Internet and mobile phone blackout on Friday 28th January 2011 and showed that there still exist ways to control the free flow of information and communications. Mobile operators operating in Egypt claimed that the terms of their operating licences left them little option but to agree to Egyptian government demands (Financial Times, 2011).

5.3 M-governance

The objective of e-government is not only efficiency, but the transparency of decisions and the consolidation of citizens' participation (UNESCO, 2009a).

Nearly all (98%) the governments have websites. Countries with no online presence include Central African Republic, Somalia and Swaziland. 88% of countries have some information about e-participation on their national portals (The United Nations, 2010, pp. 77, 87). Mobile Governance is the extension of E-governance as Internet goes wireless. ICT's benefits to governance include that it is cheaper, quicker and also that it works better (Heeks, 2001, pp. 3-4; - 2006; Heeks and Santos, 2009; Unwin, 2010, p. 4; Guida and Crow, 2009). M-governance is beginning to emerge in countries with extensive 3G networks, and a significant number of developing countries are using mobiles to adapt e-government services to mobiles that would otherwise be provided through the Internet.

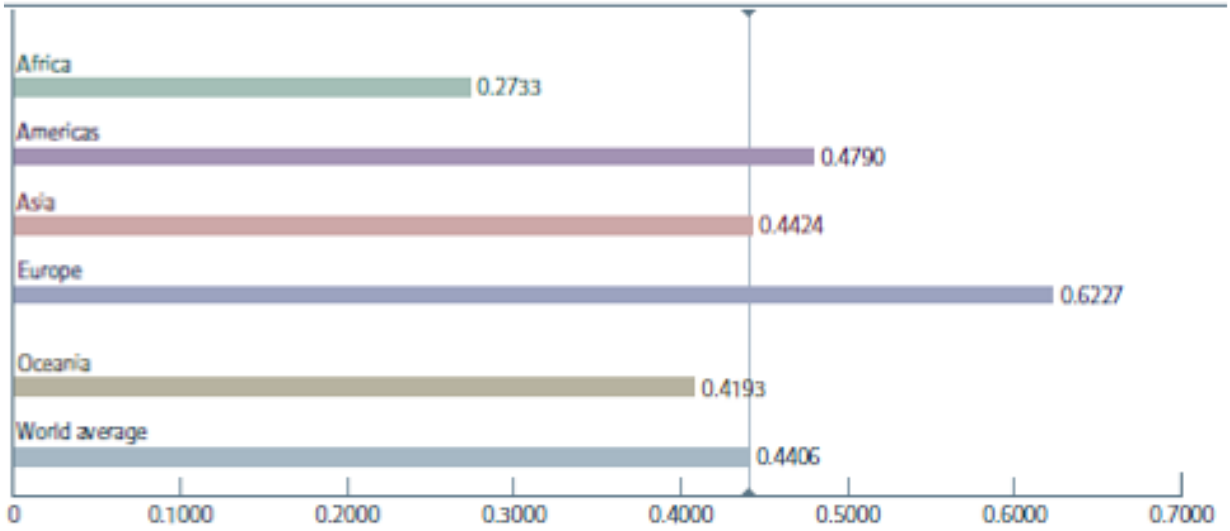
Improved transparency of governmental actions can help improve the levels of trust between the government and citizens. It is about improving government processes, connecting citizens, and building interactions and the relationships between governments and citizens with and

within civil society. The public trust can be gained through transparency and it can be further enhanced through free sharing of government data based on open standards (The United Nations, 2010). The policy dilemma of governments is how to balance openness with legitimate privacy and protection of interests.

Technology is an enabler in eDemocracy, not a goal. The barriers to greater online citizen engagement in policy-making are cultural, organisational and constitutional, not necessarily technological (European Commission, 2009b, p. 53). The aim is to have better communication between citizens and governments in a more convenient manner and at lower cost, greater scope and reach. It is also about providing better access to services as well as having a more personalised services and mediums for two way communications. Many small solutions and services together will eventually empower citizens (Hellström, 2008).

Governments do not only have a role as regulatory agencies but can become key players in the efforts to scale mobile services. In the area of m-payments and financial transactions, it may be possible that government agencies paying out salaries as well as benefits take on m-payments in scale and show example to others. Similarly, governments play a critical role in using mobile channels in healthcare delivery and educational services. It is possible that in those countries where governments are taking a more proactive role in leveraging the mobile channel to deliver government services, scaling along a variety of other services becomes possible faster and more simply with enabling regulation in the interest of the government itself (Verclas, 2010).

Figure 17 **E-government development index regional averages**



Source: The United Nations, 2010

Looking at development of e-government in a global scale (Figure 17); Europe and the Americas are the only two regions above the world average. Africa continues to lag far below the world average, given that most of the world's least developed countries are in this region and they generally lack the financial and human resources to fully implement e-government. The Asian region is slightly above the world average (The United Nations, 2010, p. 61).

In the next sub-chapters more detailed analysis is provided about what types of benefits can mobile technology provide concerning the "Electoral Oversight & Civic Engagement", "Record Management" and "Emergencies & disasters".

WHAT TYPES OF BENEFITS CAN MOBILE TECHNOLOGY PROVIDE IN THE AREA OF M-GOVERNANCE AT THE BOP MARKETS?

5.3.1 Electoral oversight & Civic engagement

Mobiles can help build fairer democratic elections as e.g. election results can be sent by SMS from the polling stations immediately after counting has finished. Results can also be sent by SMS to the local radio station, which makes it harder to tamper with the results later. Also the wider use of camera phones and mobile broadband connections assist everyone to take part in election monitoring. Mobile phones have been used for election monitoring in countries such as Nigeria, Kenya and Sierra Leone. In Nigeria, SMS was used to monitor elections by having a phone number to which a citizen could text if they observed irregularities in election procedures (BBC, 2007).

Using SMS as a tool for reporting election information has been used also in India 2009 elections, where the voter registration was done via a website and the update was sent via SMS as the names of the voters were added to the voting list (Gauravonomics blog, 2009). In the same election, Indian voters were able to call to get further information about candidates, such as information about their educational background and any criminal charges they might be facing (The Economist, 2009).

Researcher Johan Hellström points out a couple of more examples of using mobiles in electoral oversight: *"Many elections in Sub-Saharan Africa have been monitored with the help of mobile phones. For example, parallel reporting was used in the Zimbabwe elections of*

2008. Election results that were posted on the door of the polling stations were photographed with mobile phones and sent to the Movement for Democratic Change (MDC) headquarters, which based on that data could announce preliminary results within 36 hours. This may be have been one of the reasons why Robert Mugabe delayed the announcement of the election results for several weeks" (Private discussion).

Castells et al. (2004) highlights one example of the role of mobiles in civic engagement by delivering information during the 2003 SARS outbreak in China. That time no news media or Internet service reported on the epidemic. Victims, their friends and families, especially those who worked in local hospitals, started to send SMS to people they knew about the disease. Another example comes from Kenya, which is among top three in Eastern Africa concerning the e-governance development. In Kenya the Budget Transparency Tool allows citizens to track the allocation of development funds and to report, via mobile SMS messages or e-mail, any irregularities identified by citizens (The United Nations, 2010, 18).

5.3.2 Record management

An efficient record management can have wide ranging effects on governance and information mismanagement. According to International Organisation for Standardisation (ISO) electronic records should conform the following principles: 1) Authenticity (the record can be proven), 2) Reliability (the record can be trusted), 3) Integrity (the record is complete and unaltered) and 4) Usability (The record can be located, retrieved and presented and interpreted) (ISO, 2001). The mobile platform brings added value especially concerning the "usability" as location based data for the records is easily provided. Mobile Data Gathering helps to collect data using mobile phones instead of paper forms or laptops. The process includes the creation of questionnaires, their delivery to mobile phones and the subsequent integration and analysis of the results. Data Gathering also provides GPS location information for each record.

While mobile platform and ICT in general provide resources for speed and access in record management, they can also be a burden. For example the problem of multiple records formats when managing electronic records can slow or even restrict utilising and sharing of records.

Brazil is among the top ranked countries in Americas concerning the e-government development. In Brazil it is possible to obtain issuance of birth certificates, identification cards, and do criminal record verification by SMS as well as manage tax returns/tax bills. Also an interesting example of mapping slums by using mobile phones comes from Brazil:

Rede Jovem, a Brazilian NGO, conducted a project in Rio de Janeiro which built a map for five different slums (favelas) by using GPS-equipped mobile phones (MobileActive Blog, 2009). Another example of mapping slums by mobile phones comes from Kibera, which is one of the world's biggest slums in Kenya. There the community was willing to participate because they believed that a geographically marked community would improve service claims to the government (This Magazine Blog, 2009). A negative effect of mapping can, however, be that the government gets a better picture of the life in the slums and starts intervening more with this illegal structure of the society. Hopefully the effect is mainly the other way round as getting a better picture of the reality would also help in doing something to improve the living conditions.

Another interesting example of using mobiles for record management comes from Liberia. Birth registration is one of the fundamental services of the state and in Liberia only 4% of all children have a birth certificate. Crisis Management Initiative (CMI) together with the Ministry of Health and Social Welfare of Liberia and members of the Universal Birth Registration Task Force started the reinstatement and decentralisation of the birth registration at the beginning of 2010. Mobile birth registration, with Nokia Data Gathering as a core, aims to register 90% of all children under five years old. The biggest advantages of a mobile phone-based record management system come from avoiding carrying vast quantities of paper or multiple electronic devices as well as the speed of recording and reporting. More detailed analysis about mobile data gathering is analysed in the next chapter on health.

5.3.4 Emergencies & Disasters

Mobiles are an important tool for reaching people in emergency situations especially when there is a need to spread disaster warnings quickly and with a wide reach. Also location-based services (LBS) are great help in emergency situations as the ability to pinpoint the location of an individual has vital value for emergency services. LBS enable users or machines to find other people or machines, just as they enable users to identify their own location (Steinbock, 2005, p. 109).

In Haiti 2010 earthquake the logistical details & delivery of verifiable information to rescue teams was sent by SMS. A Survey conducted after the disaster, found that 92% of respondents found the system and information "very useful" (The Guardian, 2010a).

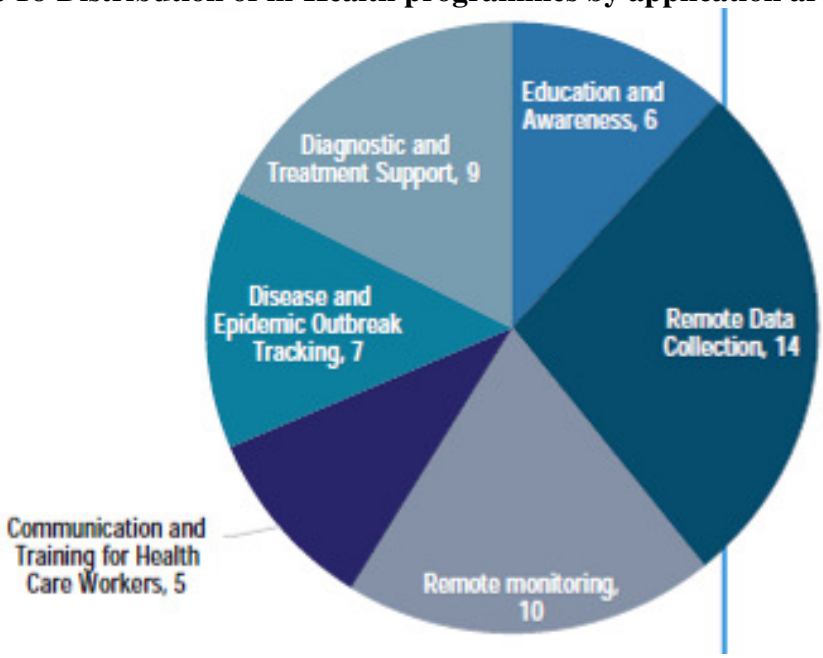
5.4 Health

64% of all mobile phone users are in the developing world. This growing ubiquity of mobile phones is a central element in the promise of mobile technologies for health (Vital Wave Consulting, 2009).

According to the World Health Organisation (2006), among 57 countries, mainly in the developing world, there is a critical shortfall in healthcare workers, representing a total deficit of 2.4 million healthcare workers worldwide. This human resources constraint intensifies the already increasing pressure on developing-world health systems (Vital Wave Consulting, 2009, p. 7).

Due to increased mobile penetration and mobile health services, more people in developing countries, especially in rural areas, have access to various forms of healthcare. 75% of the developing countries have launched some m-health initiatives (ITU, 2010). Mobile technology has been piloted in a range of health-related areas, such as facilitating delivery of medical information, remote diagnosis and disease tracking and prevention by data gathering solutions (Figure 18). In all these areas, evidence exists that mobile phones can play an important role, especially in hard-to-reach populations (Vital Wave Consulting, 2009, p. 5).

Figure 18 **Distribution of m-Health programmes by application area**



Source: Vital Wave Consulting, 2009.

Both m-health and e-health aim is to improve health outcomes, and these technologies work in conjunction. For example, many e-health initiatives involve digitising patient records and creating an electronic 'backbone' that ideally will standardise access to patient data within a national system. M-health programs can serve as the access point for entering patient data into national health information systems, and as remote information tools that provide information to healthcare clinics, home providers, and health workers in the field. While there are many stand-alone m-health programmes, it is important to note the opportunity m-health presents for strengthening broader e-health initiatives (Vital Wave Consulting, 2009, p. 8).

Most of the innovations in mobile technologies for health and medicine have yet to go beyond the pilot stage and the question with their economic viability needs to be considered seriously. Convincing evidence regarding the overall cost-effectiveness of mobile phone "telemedicine" is still limited and good-quality studies are weak and rare. Grant-based projects in developing countries are tolerated because they are free, but they collapse when the grant expires (Rashid and Elder, 2009). According to Greg Elphinston, Nokia Director for Corporate Social Investment: "*We should not be surprised when grant-based projects collapse after the money is consumed. The sustainability plans rarely amount to more than grant renewal or wishful thinking*" (Private discussion).

Even though most m-health projects are still at the trial stage, a joint report by the UN and the Vodafone Foundation documented around 50 m-health projects across the developing world (Vital Wave Consulting, 2009). According to the report the main constraints of m-health are connectivity limitations and the quality of diagnostics.

It can still be argued in what magnitude the mobile health services can replace the face to face meetings with a health professional. However, in the situation where a mobile solution is the only service available, it is surely better than no health service at all. Another concern is how much money is spend to the building and maintenance of IT-infrastructure and ICT-consultants' salaries maintaining and developing further the mobile based health system?

In the next sub-chapters more detailed analysis is provided about what types of benefits can mobile technology provide concerning the "Mass or targeted delivery of medical information", "Disease tracking & prevention", "Medical administration" and "Wellness".

WHAT TYPES OF BENEFITS CAN MOBILE TECHNOLOGY PROVIDE IN THE AREA OF HEALTH AT THE BOP MARKETS?

5.4.1 Mass or targeted delivery of medical information

Mobile phones can be used for raising awareness about health related issues and to deliver medical information on e.g. diseases, vaccinations, maternal & infant care. This can be easily done by SMS. A good example of delivering medical information by group SMS in the developing countries is Frontline SMS. It has been deployed in over forty countries for a wide range of m-health activities including blood donor recruitment, keeping medical students informed about education options, coordinating health care workers and monitoring disease outbreaks. A similar example comes from Uganda, where "Text to change" has been one of the pioneers in using mobile phones for health monitoring and advocacy. Text to change" SMS Quiz resulted a 40% increase in attendance in HIV/AIDS testing (MobileActive Blog, 2011).

Mobiles can also be used to deliver information about counterfeit drugs. Some 10-25% of all drugs sold are fakes, according to the World Health Organisation, and in some countries the proportion can be as high as 80%. Bright Simons, a Ghanaian social entrepreneur, has devised a mobile phone based system called mPedigree in Nigeria and Ghana, which tries to help with the problem of counterfeit drugs: A scratch panel on the packaging reveals a code which can be sent by SMS to a special number to verify that the drugs are genuine (The Economist, 2009). This sort of simple innovations can have a wide reaching impact.

Many mobile services are offered to increase awareness of e.g. HIV and AIDS in developing countries through help lines and SMS alerts, which remind patients to attend a clinic or take medicine One example is project Masiluleke, which resulted calls to the National Helpline to rise significantly, from 1000 to 4000 (Pyramid Research, 2010, pp. 91-92).

Also Nokia has medical information services for the BOP consumers. Nokia Life Tools Healthcare provides information and tips for health and diet. Information about diseases includes respiratory illnesses, Hepatitis B as well as female and male specific illnesses.

5.4.2 Disease tracking and prevention

Mobile enabled data gathering for health data is among the most popular m-health services. Remote data collection enables the gathering of health information faster and more accurately. Camera phones are found useful as well, as it is possible to send pictures to remote specialists

for diagnosis (Kinkade and Verclas, 2008; Vital Wave Consulting, 2009; The Economist, 2009).

Mobile phones as a data collection tool offer convenience through their usability, size, and weight and battery longevity. They also offer additional features such as GPS location data and imaging. The more time-critical the information, and the more remote the location is, the more organizations have to gain from a mobile phone based solution. Since mobile phones can send data from remote locations, collected data can be transmitted in near real-time for analysis. Some data gathering systems need Internet connection for sending the data and in some places this might be a barrier. The SMS based system is an option, but SMSs can also be costly.

Programme for Accessible Health, Communication and Education PACE runs a mobile data gathering system in Uganda. Director Jonathan Macoola claims that according to their analysis, *"as much as 50% of time saving has been found after introducing a mobile data gathering system, compared to dealing with paper forms. One of the advantages is also that mobile enabled data gathering makes the geographical/location based analysis of the data much easier and actually automatic. Above all, the quality of the data is much better for a simple reason: the data cannot be sent if every required data point is not entered to the mobile data gathering form. Besides making data better and more complete, the job of data cleaning and seeking for complementary data becomes unnecessary as well. "When using paper forms the data was often incomplete. This made the analysis much harder and more time consuming". One of the big advantages of the system is also the opportunity for instant analysis and reporting and the possibility for regional offices to conduct analysis by themselves"* (Private discussion).

Macoola also mentions another interesting advantages of mobile data gathering related to medical packages delivered for free by various NGO's in Uganda: *"It is not rare that a person goes from one health centre to another by asking for similar free delivery packages, for example in the field of family planning. If the NGO's and local authorities would do more co-operation and put up a common mobile based reporting system and a central database, double reporting about derived products would be avoided and help could be delivered to a wider range of people"* (Private discussion).

One concrete example of benefits of mobile data gathering comes from Brazil where every year hundreds of people die of dengue fever. Nokia Data Gathering (NDG) is used for

fighting back dengue fever in Amazonas where it resulted in 93% decrease in registered cases from year 2008 to 2009.

5.4.3 Medical administration

Mobiles have been used by the medical administration for various actions such as sending reminders & alerts, informing citizens about disease testing locations and timings as well as patient monitoring. For example, in Thailand, in project Chiang Mai and in South Africa in Project Simpill an adherence of over 90% was attained due to daily text /voice message medication reminders for tuberculosis (The Nation, 2007).

The development of mHealth is proceeding hand in hand with changes in the structure of health delivery. MHealth applications can help healthcare providers managing costs e.g. through the use of in-home monitoring to avoid hospital stays. Individuals are taking greater responsibility for their own health both because there are technologies and services that enable them to do this, and because the cost of system-based delivery of healthcare is increasing. The boundaries between the "healthcare system" and new providers of services is blurring as services and applications emerge to which individuals have direct access and which they want to use, independently without assistance of healthcare system professionals (Leslie et al., 2011).

5.4.4 Wellness

Welfare diseases are to boom in the emerging markets and by 2025 80% of all new diabetes cases will originate in developing countries (The World Diabetes Foundation, 2006). Mobiles can be used for supporting a healthier lifestyle by using them as a medium to deliver for example nutrition advice, health metrics or using them to keep track of sports activities. For example, in South Africa, SMSs are sent to encourage patients with type 2 diabetes to adopt healthier lifestyles. SMSs are supplemented by group meetings to help educate patients and provide face-to-face support (Cellular news, 2010).

Different mobile wellness applications can help people to improve and manage their wellness. Applications allow to set individual goals and to choose targets in a wide range of wellness areas e.g. weight, sleep, exercise and diet. Different sports applications can calculate how much a person runs or walks in their daily life and tell the distance covered and energy used. It is also possible to see the progress immediately with graphs, share results and get feedback from others.

5.5 Education

New solutions have to be found to reach the "Education for All" (EFA) goals. ICT have the potential to increase access to knowledge and to contribute to building educated and engaged populations worldwide (UNESCO, 2009a)

According to UNESCO there exists a global shortage of 10.3 million teachers in the world (UNESCO, 2010). While the traditional model of classroom-based education may remain the core of national education systems, new technologies have been tried and tested for their potential use in education, particularly to expand access to education. Technology has been found useful, but it hasn't had a profound impact on education, partly due to the lack of available and appropriate content. It has been noted that for this reason the so-called "digital divide" may be less related to equipment and technology than to content (UNESCO, 2009a).

The concept of mobile learning (m-learning) – understood as learning facilitated by mobile devices – is however gaining popularity in the developing world. Mobile learning devices have the potential to achieve a large-scale impact especially due to their portability, low cost, and versatile features (Roschelle, 2003). According to Riitta Vänskä, Senior Manager, Learning & mobile solutions in Nokia: *"Mobile Phone is the laptop of developing countries and there is a huge possibility to harness that for learning by approaching children with their own tools and with their own way of sharing information and harnessing their social media network for learning "*(Private discussion).

A convergence of rapid advancements in information and communication technology (ICT) and the increase in processing power, storage memory, and connectivity have resulted in growth in personalised learning solutions (Pea and Maldonado, 2006). As Greg Elphinston, Nokia Director for Corporate Social Investment puts: "*Children learn better in a context that mirrors their everyday environment, not the everyday environment of their grandparents. The presence of technology not only builds a perception of relevance in the minds of students, it has a motivating effect as well".* As to the challenges, Elphinston adds, "*Mobile phones are not yet seen as 'serious' IT products, appropriate for public procurement. This is a major obstacle to the fulfilment of the industry's potential in this sector*" (Private discussion).

WHAT TYPES OF BENEFITS CAN MOBILE TECHNOLOGY PROVIDE IN THE AREA OF EDUCATION AT THE BOP MARKETS?

5.5.1 Educational reach and equality

Mobiles can help overcome the urban-rural education gap by affordably transferring teaching materials & resources over long distances. Key words are portability and affordability; learning with mobiles is possible regardless of place, time, gender, age or income. M-learning makes education more accessible by enabling learners to pursue their studies according to their own schedule at all times and in all places, during breaks, before or after shifts, at home, or on the go. According to a study conducted by Vavoula, many people actually utilise the time spent in transit to learn (Sharples, Taylor and Vavoula, 2005, p. 3).

Vanessa Frías-Martinez, PhD. Researcher at Telefónica Research tells an example of educational reach through *Educamovil* project in Peru, in which the time spent in transit is used for learning purposes: *"Educamobil is a mobile learning project in underprivileged schools in Lima. The project proposes the use of educational mobile games for students to use during their downtimes while they travel by bus or whenever they have free time. Mobile penetration rates in Latin America among the youth is very high, and they use their mobile phones a lot to play and entertain themselves. The project proposes the use of this behavioural pattern to add educational games in their daily lives. Teachers can create educational content through a PC-based tool and content is downloadable onto a mobile phone. We are also developing a tool to gather game use statistics so that teachers can understand which the questions are where students fail the most* (Private discussion).

Another interesting example of educational reach and quality is the BBC WST project in Bangladesh, which provides high quality English learning tools using mobile, television and the Internet to millions of people, many of whom live on less than £2 a day. The project resulted in over 500 000 incoming calls in the first few weeks alone (BBC, 2009).

Nokia Life Tools also aims widen educational reach and equality by providing English language lessons, general knowledge as well as information on higher education, career guidance, exam preparation and tests.

5.5.2 Educational quality

The convergence of mobiles with other ICTs has the potential to improve distance teacher training programmes. It is possible to use mobiles for interactive group learning as well for personalised learning purposes. Mobiles offer new teaching and learning process by creating

new modes of delivery & interaction especially with the help of rich features in mobiles, such as cameras, video and audio recording.

In the SEMA project in Kenya 2006, primary school teachers were using SMS, video, radio and audio for distance learning via mobiles. Results were very good: about 85% of the registered users were active on the system and over 250 000 SMS messages were sent (Vodafone, 2008).

Nokia Education Delivery uses mobile technology to deliver educational videos to mobile devices. It enables an easy access to quality educational videos in remote locations and helps to improve educational standards & support teachers to develop lessons. By connecting the mobile phone to a TV or a projector, the teacher can play the videos to a class.

Another Nokia example is Mobile Learning for Mathematics in South Africa. This allows access to math lessons on Mxit[7]via mobile phone. It focuses on active learning by delivering interactive study packages to students' mobile phones and taking advantage of social networking. There have been more than 150,000 visits to the service with 50% of students & two thirds of teachers participating. 14% competence increase was seen in a period of few months and 82% of all usage took place outside of school hours.

According to project responsible Riitta Vänskä: *"children were excited about the positive competition atmosphere that was around the mobile learning for mathematics service, children were competing against themselves trying to get better activity and competence score, competing with each other. There are very few technologies that have been taken to schools which have had such an easy and good uptake than taking the mobile technology to schools. The project challenged many earlier assumptions related to technology at school"* (Private discussion).

Jussi Hinkkanen, Head of Government Relations for Nokia in Middle East and Africa states that;*" Africa faces a huge capacity development challenge over the coming years with a rapidly increasing population. We need to harness all possible means for improving access to formal and informal education and as for now; mobile platforms provide the largest and most ubiquitous platform for education services delivery. In particular informal approaches can be powerful as new pedagogic approaches and peer networking can be used to stimulate*

[7] MXit is an instant messaging application in South Africa that runs on multiple mobile and computing platforms. MXit currently has 27 Million subscribers, making it the largest social network in Africa, with 40 000 new subscribers joining everyday.

learning, without burdening the overly stretched public education system" (Private discussion).

5.5.3 Literacy

Literacy is a human right unequally distributed among the world's population. Despite global efforts to fight illiteracy around 759 million adults are illiterate, which represents around 16% of the world's adult population. Two-thirds of who are women and majority live in the rural areas (UNESCO, 2010).

Illiterate are at the highest a risk to be dropped out of information society development. Those with the least amount of schooling will find it more difficult to participate in the evolving knowledge-based societies (Reimers, 2000). However, the threshold for mobile phone use is becoming lower as literacy is not necessarily needed because of icon based menus and voice enabled applications. This is a very important factor in less developed countries with high illiteracy levels (Obadare, 2006).

Illiteracy is not a barrier to mobile phone use and a mobile phone can actually be used for assisting learning to read by using, for example, literacy and language games. A recent example comes from Pakistan in 2009, where Mobilink and UNESCO teamed up to use SMS messages to improve young women's literacy rates. Project showed striking gains improving literacy, with the share of participants receiving the lowest scores dropping by nearly 80% (Vital Wave Consulting, 2009, p. 19). Another example from year 2009 comes from Rural India where children showed improvement in spelling and general literacy after using mobile educational games (Bhavnani et al., 2008).

Nokia Director for Corporate Social Investment Gregory Elphinston well defines the relation between mobiles and illiteracy: *"Learning how to read or knowing whether a hospital is open or closed are not (or should not) be lifestyle choices. Phones are the text books of tomorrow. They can help 800 million illiterate adults to learn to read. What more powerful outcome could we achieve for social and economic development than this? Communication is a right, not a privilege. Mobiles are not luxuries, they are tools of development"* (Private discussion).

5.6 Social and Cultural

Despite the fact that in a large part of India there are only six hours of electricity a day and telephone landlines and drinking water are inadequate, the country sees its potential growth secured by building an information society (Unesco, 2009a).

Mobile phones are reaching practically all social classes and groups and mobiles have begun to have increasingly important effect on the ways in which individuals work, relate to others and socialise (Castells et al., 2007; Ling, 2004; Kwan, 2007; The Economist, 2009). Mobile connectivity can be said to both reflect and intensify social ties. Without social ties the mobile phone, which is predominantly used for social contact, is apparently of little use (Ling, 2004; Livesay, 2003).

People do not consider a mobile phone to be a luxury; on the contrary, they consider it a necessity, which is well crystallised in the phase: “I’d rather forget my wallet at home than my mobile” (Commander et al., 2010). 62% of people consider that mobile phone expenses would be the last (32%) or would be in the last three (30%) expenses to be cut down (Frost & Sullivan, 2006).

The use of mobiles in social and cultural domain is particularly strong among the young and relatively affluent in both the developed and developing world. There exist only a few studies (e.g. Tenhunen, 2008) exploring what mobiles and communications technology is doing to social and cultural systems and norms. These gaps in knowledge and understanding are particularly large in the emerging growth countries.

According to Matti Tedre, a professor of computer science in University of Eastern Finland and Tumaini University in Tanzania: *"It is not the case that mobile phones are just replacing the medium of previous behavioural and social patterns: Mobile phones enable new dynamics of social interaction and communication altogether"* (Private discussion).

One interesting aspect of cultural and social impact of phones is related to different applications for religious life. For example the Ramadan apps for Muslims, among other things, let believers browse the Qur'an, indicate the direction of Mecca at prayer times, find the nearest mosque and show the nearby restaurants serving food prepared within Islamic guidelines (The Guardian, 2010b).

However, also negative impacts of mobiles to social life can be seen as growing numbers of mobile phone users complain that their employer expects them to be available virtually 24 hours a day. Always contactable has come to mean always available, to the point where people are finding work taking over their evenings, weekends and even holidays (ITU, 2009).

According to BOP expert Paula Linna one gender related negative social aspect has been seen especially in the developing countries as "*men are controlling how the women are using mobile services and instead of empowering the ladies, the result might be contrary* (Private discussion). According to GSMA "the Gender gap hot spots," where the gender disparity of owning a mobile phones is greater and the widest is in South Asia, which includes Afghanistan, India and Nepal. There, a woman is 37 percent less like likely to own a mobile phone. Closing this gender gap would generate close to $4 billion in revenue for telecommunications companies (Bloomberg Businessweek, 2011).

In the next sub-chapters more detailed analysis is provided about what types of benefits can mobile technology provide concerning the "Cultural norms", "Safety & Privacy" and "Media, Publishing & Entertainment".

WHAT TYPES OF BENEFITS CAN MOBILE TECHNOLOGY PROVIDE IN THE AREA OF SOCIAL AND CULTURAL AT THE BOP MARKETS?

5.6.1 Social capital and networking

Mobile technologies are enabling people to create their own micro-cultures and embrace ability to modify technology for their own use (MIT communications forum, 2005). Mobiles can now be increasingly compared to collective social devices. As mobiles create dynamic relationship to the Internet "on the move", the idea of digital spaces as instances disconnected from physical spaces no longer applies (de Souza e Silva, 2006, pp. 3, 27). For this reason mobiles can also lower for example urban-rural differences as the sense of belonging to a place is slowly giving way to a sense of belonging to a communications network.

Mobiles can also help with social empowerment and be a signifier of social status. In a study conducted in Brazil, 10% of respondents said the acquisition of a mobile translated into feeling more important, and 24% felt more accompanied. Economists are interested in social capital for its contribution to productivity and spill over from the individual to the group and

society. A network effect is clearly one of the major impacts that mobile phones provide in the social space (Bhavnani et al., 2008, 19).

Anthropologist Sirpa Tenhunen has studied what kind of new social constellations mobile phones enable and how these relate to culture and cultural change in West Bengal in India. Villagers emphasised the phones' usefulness in helping to reach relatives in order to invite them to attend rituals such as funerals and weddings. Mobiles have also become an effective medium for discussing marriage arrangements in India. Phones have made it easier to express opinions about proposed marriage partners and rejection no longer needs to be conveyed face to face, but can be done by phone (Tenhunen, 2008). Mobiles also help villagers keep in touch with those relatives who have emigrated to other districts or abroad. Earlier, a woman whose son worked outside West Bengal was able to talk to him once a year, whereas now the son calls his parents weekly (Tenhunen, 2008).

5.6.2 Cultural norms

Mobile phones can influence social, caste and racial ties.

Through academic research in Uttar Pradesh in India it was found that mobile games created new social ties across caste and village boundaries. The introduction of mobile learning games did not only strengthen existing social relationships, but also facilitated new social ties to be formed. The new relationships cut significantly across gender, caste and village boundaries. Children from different castes, genders and villages, who were not previously acquainted, bonded via the process of helping one another to play the mobile learning games. The social relations that were developed in the context of this gaming community were observed as being transferred to the participants' everyday lives. They also continued to interact more deeply with one another in a real world in non-gaming settings changing the cultural norms of the village (Kumar et al., 2010).

A change in cultural norms related to the use of mobiles has very much to do with gender issues. Tenhunen found that in rural India mobile phones help women extend their domestic sphere and women considered improved communication systems playing a major role in advancing their social position. For example, unmarried girls deciding a groom to marry paid attention not only to the aspects such as whether the new home has a motorcycle, but also whether there is a mobile phone in the house or in the neighbourhood (Tenhunen, 2008). The

GSM Association's report with the Cherie Blair foundation found that 85% of women are feeling more independent because of their mobile phone (Vital Wave Consulting, 2009).

Tenhunen brings up a negative aspect of mobile phones that she acquainted doing research in the slums of Kenya: "*many people raised the issue that the adoption of mobile phones has boosted the number of extra-marital affairs"* (Private discussion). Also Jan Chipchase writes about the use of multiple SIM-cards linkage to extra-marital affairs in CGAP technology blog: *"The use of multiple SIM cards is a relatively common practice in emerging markets: primarily driven by a desire to save money, a desire to separate personal and work communication and/or personal from very personal e.g. extra marital affairs" (*Chipchase blog, 2010*).*

5.6.3 Safety & Privacy

A mobile device is considered as a security device for most women in developing nations (Telecom World blog, 2009). For example when men travel outside the village, they often leave their phone at home so that they can call home from public phones or other people's mobile phones (Tenhunen, 2008). Already mentioned security benefit of mobile was mentioned in the sub-chapter about mobile money; when storing money in mobile banking there is no fear to be hijacked. The use of mobiles related to security is also raised when talking about parental oversight of children (Ribak, 2009, p. 184).

Location Based Services (LBS) is one of the most interesting developments in the telecom industry. However, providing an ability to locate the position of the user has both positive and negative effects. Tracking and monitoring individuals can sometimes be useful from the security point of view, e.g. in emergency situations, but this information can also be misused and considered imprudence of personal privacy. Most people probably do not realise that whenever a mobile phone is on, the location is known to the network operator. Even a simple phone can be tracked and both the content of the communication and the identities of the parties involved are able to be discovered, sometimes even retrospectively (Verclas & Mechael, 2008).

The use of mobiles can sometimes be seen also as an intrusion on personal space and privacy through conversations in public spaces as those seen as lacking discretion and basic courtesy (Commander et al., 2010). Another interesting privacy and security point of view is linked to protection of personal information when recycling mobile phones. A large amount of –

sometimes confidential – information can be stored on mobiles, for this reason it is important to wipe all the data and settings from the phone before recycling them (ENISA, 2010, p. 5).

5.6.4 Media, Publishing & Entertainment

Mobile phones are portable entertainment devices. When talking about mobiles and entertainment the mobile games are usually the first thing to come to mind. People want to use mobiles also for doing fun things. For example Nokia Life Tools entertainment offering is among the most popular parts of the whole service. However, games can also have other means than just entertainment as they have proven to be useful for example in learning as was seen in the last chapter.

Accenture (2010) report shows that emerging market consumers are more likely to be active on social media channels than niche in mature markets. Social media helps emerging market consumers get the most out of their tech purchases. Consistently, emerging market consumers are more likely than their counterparts to tweet, watch videos on mobile phones, write blogs, contribute to Wikipedia, play video games on the go, participate in online communities and connect with people on social networks. Social networking sites are among the most attractive phone applications in the emerging markets.

Also mobile TV is booming in emerging markets: With a predicted mobile population of over 1.5 billion users by the end of 2013, China and India are set to generate more revenues from mobile TV services than Europe and North-America combined. Mobile TV is successful in emerging and developing markets for several reasons:

1) Greater variance between TV and mobile penetrations:

The number of TV households is much lower than in developed markets, so there are considerably more mobile phones than TV sets.

2) Lower expectations:

The TV audience in emerging markets is used to crammed conditions and old, low quality television sets. The mobile TV experience is comparatively better. The threshold at which the quality of mobile TV stream or broadcast becomes unacceptable is therefore much harder to reach.

3) Lack of information sources in nearby environment:

With small internet and TV penetration rates, the number of ways in which to access information is fairly limited and tedious. Mobile TV offers a much simpler way to access e.g. news (De Renesse, 2011).

News is also related to user generated content and citizen journalism as mobiles allow people easily and on the move to create and share media content and instantly publish it to the whole world. Citizen journalism is very popular e.g. in the Philippines, where citizen-generated news links, photos, and videos often spread quickly and widely via social networking sites. People are turning into news producers and this way empowering themselves and directly influencing the socio-political changes in the country (IPS news, 2010).

People tend to consume different kind of entertainment content on their mobile phones, even though the same content would be accessible by computer. One interesting aspect to mobile publishing is mobile phone novels, originally started in Japan by young women writing love stories, have grown into a mainstream literary culture. According to The New York Times (2008), five out of the ten best-selling novels in Japan in 2007 were originally mobile phone novels.

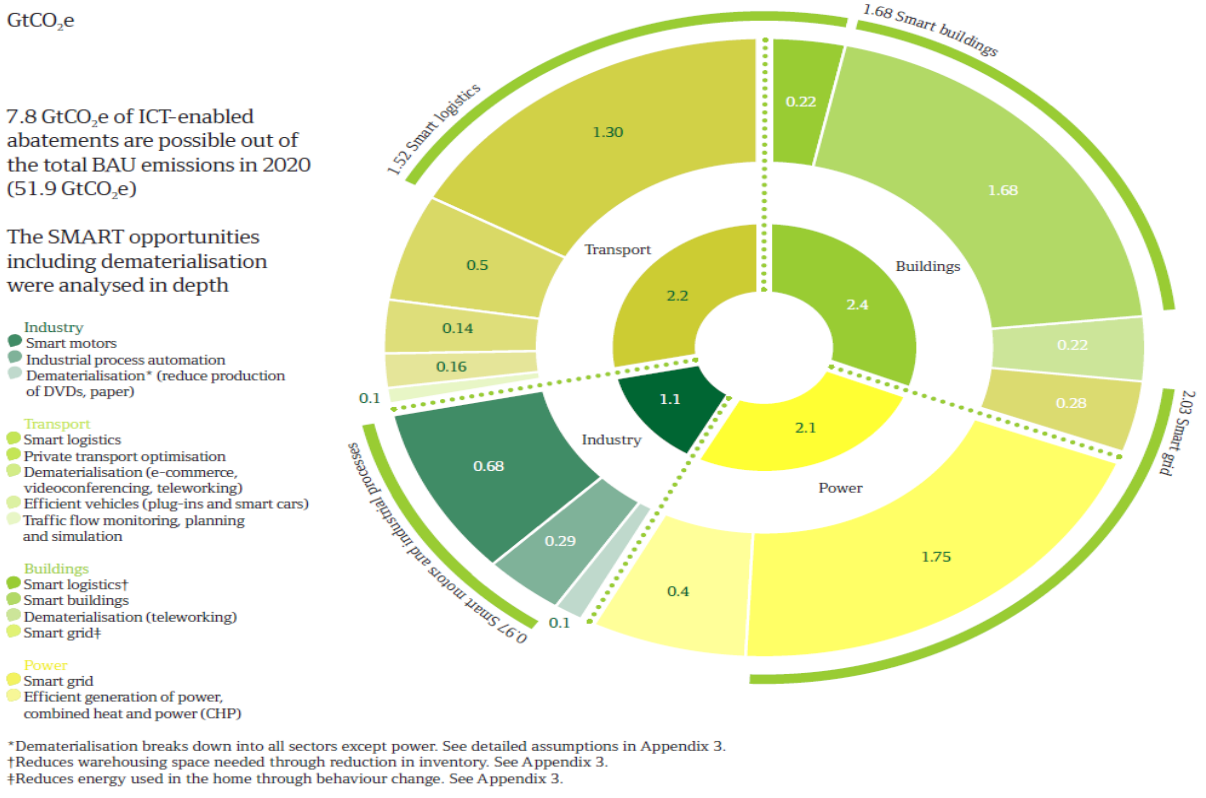
However advertising on mobile phones has been slowed down by consumer resistance as well as restrictions of the small screen size. Consumers must consider by themselves how much privacy they are willing to trade for cheap or free of charge mobile phone services and applications. One hurdle is also the affordability aspect as the multimedia-capable phones aren't the cheapest ones in the market. For many in the developing countries these phones cost more than a month's salary, yet people save for long periods to buy one.

5.7 Environment

"If 10% of the world's mobile phone users turned off their chargers after use, the energy saved in one year could power 60,000 European homes" (GSMA, 2008).

According to Smart 2020 report, ICT can make a major contribution to the global response to climate change. It could deliver up to a 15% reduction of business as usual (BAU) emissions in 2020 (7.8 GtCO2e.) This saving in CO2e is more than five times the size of the sector's own footprint (Smart 2020, p. 03/50) (Figure 19). However, as I point out later in this chapter the environmental impacts of mobile technology aren't only positive.

Figure 19 **ICT: The enabling effect**



Source: SMART, 2020, p. 03/30.

According to Salla Ahonen, Nokia Director for Environmental Policy: *"ICT sector has an important role in building a more resource efficient, low-carbon digital society and the possibilities offered to other sectors as well as individuals should not be compromised. New features and services replace the need for new products or for example travel by offering music without the need for CDs or offering the possibility to connect to other people without having to be physically in the same place"* (Private discussion).

Caring for the environment can start by examining the things we use on an everyday basis such as mobile phones. A simple example is to start using mobiles for many purposes instead of buying separate devices such as a music player, an alarm clock, a camera, a game machine or a video recorder. A car navigator and a maps application can help in reducing the traffic related emissions and can be found in various mobile phones free of charge. Mobiles offer many gadgets in one device.

However, also negative aspects appear as product innovation leads consumers wanting to buy newer phones, adding to the e-waste cycle. Also more and more energy are being used to manufacture the phones: The United Nations Environment Programme estimates that the manufacture of a mobile phone produces about 60 kg of CO2e and that using a mobile phone for a year produces about 122 kg of CO2e (GSMA, 2009a). Besides energy used for

manufacturing the mobile phones, also the growing number of data centres use a vast amount of energy. The use of energy is not the only critical aspect, but the question where this energy comes from, e.g. from renewable energy sources.

Environmentally friendly actions are also good for business. For example Nokia saved 500 million Euros in two years by reducing the size of the packaging. 100,000 tons of paper-based material was saved and the effect of this reduction took off every second truck transporting the products. In addition, Nokia started selling mobile phones without a charger, which made packages around 25 % smaller. In addition to savings in logistics, excluding the charger from the packaging also enabled reductions in both energy consumption in the production phase and in the end of life treatment needs.

In the next sub-chapters more detailed analysis is provided about what types of benefits can mobile technology provide concerning the "Take back & Recycling", "Resource consumption" and "Mobiles for sustainable consumption".

WHAT TYPES OF BENEFITS CAN MOBILE TECHNOLOGY PROVIDE IN THE AREA OF ENVIRONMENT AT THE BOP MARKETS?

5.7.1 Take back & Recycling

The key philosophy in all recycling *is "from waste to resources"*: "One person's waste can be another's raw material". E-waste should serve as a valuable resource base for scarce metals as it is growing at a rate of about 40 million tonnes per year (UNEP, 2009).

New phone models emerge frequently and people tend to change their phones on average every 18 months. This gives an impression of non-durable consumer good, which is a problem from environmental perspective as very few people tend to recycle their phones. Mobile device manufacturers can show an example as leading recyclers and promote a change in people's recycling behaviour. It is much easier to take the mobile to a recycling centre than, for example a TV.

The environmental as well as the economic benefits, of recycling metals far exceed those of other materials in the phone. Recycling metals requires 60-90% less energy than mining and dressing metal from ore (Forum for the Future, 2006). For every 1 million recycled mobile

phones 34kg of gold, 351kg of silver, 15kg of palladium, and 16kg of copper can be recovered (The US Environmental Protection Agency, 2010). 65-80% of the materials in a Nokia mobile phone can be recycled. However, in 2008 Nokia surveyed 6,500 people in 13 countries — including Nigeria, India, China, Indonesia and Brazil — to find out people's attitudes and behaviours towards recycling: only 3% said they had recycled their old phones (Intomobile, 2008).

Due to higher levels of regulation in Asia, the E-waste shipping is beginning to shift to Africa, where there are limited facilities for dealing with this increasing inflow of toxic waste. In many developing countries, backyard recyclers recover very little value compared to more efficient industrial recycling plants (UNEP, 2009) which causes significant environmental problems.

5.7.2 Resource consumption

It is apparent that recycling mobile phones have significant impacts for resource consumption.

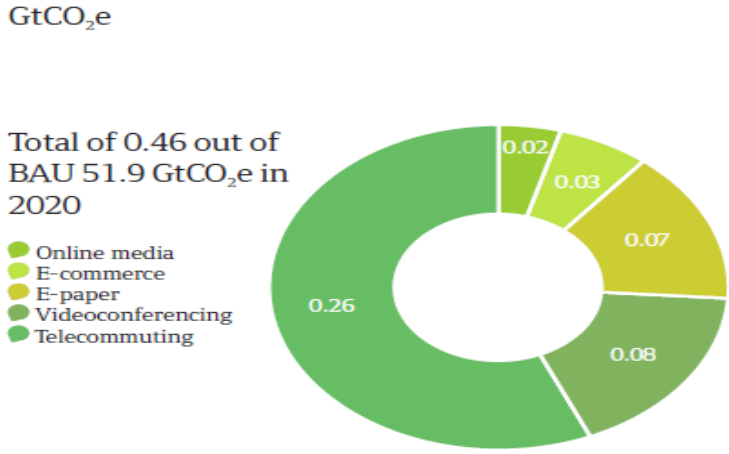
There is a finite supply of metals available on our planet and altogether 40 raw elements from the periodic table are needed to make a mobile phone (UNEP, 2009). Metals such as gold, silver and palladium are used in phones and networks due to their superior electrical conductivity and resistance to corrosion. All of these metals require large volumes of earth to be moved and large amounts of energy to source. The mining process itself is a toxic polluter (GSMA, 2009c).

A tonne of ore from a gold mine produces on average 5 grams of gold, whereas a tonne of discarded mobile phones can yield 150gr or more. The same volume of discarded mobile phones also contains around 100kg of copper and 3kg of silver (Yokohama Metals Co. Ltd, in ERT, 2010, 28). Another interesting finding is that the 400 million mobile phones discarded every year contain an amount of gold that is worth $271 million – enough gold for over 1.5 million gold rings (Forum for the Future, 2006). Luckily the size of the mobile phones has changed: the first generation of truly portable phones was large and heavy; today mobile phone handsets typically weigh less than 100g.

Apart from reusing the recycled materials, the key concept in resource consumption is dematerialisation, which means having all gadgets in one device. Dematerialisation means

substitution of high carbon physical products with low carbon digital alternatives; meaning for example replacing CD's/DVD's with digital downloads. Purchasing music digitally reduces the energy and CO2 emissions associated with delivering music to customers by between 40% and 80% from the best-case physical CD delivery, depending on whether a customer then burns the files to a CD (Weber et al., 2010, p. 754). Another good, simple example is to use a mobile phone for Internet browsing; it is possible to make 100 Facebook updates by using your mobile, compared to the same energy used for one status update made by a desktop computer (Forum for the future, 2006 & Nokia Conversations blog, 2010).

Figure 20 **The impact of dematerialisation**



Source: SMART 2020

Currently the largest opportunity identified within dematerialisation is teleworking – where people work from home rather than commute into workplace (Smart, 2020; Figure 20) For example, if a significant number of people worked from home more than three days a week, this could lead to energy savings of 20-50%, even with the increase in energy used at home or non-commuter travel. A great deal of research has also found that one of the greatest impacts of mobiles has been reducing the need to travel. (GSMA, 2007; Smart 2020; Vodafone, 2005).

Timo Kolehmainen, Nokia Director, Sustainability Measures & Reporting summed up the benefits of mobile technology from the environmental perspective: *"Mobile phones can help in saving natural resources and in the fight against climate change in various ways. Mobiles are small and energy efficient and they converge several separate devices into one. Mobile services can also enable people to avoid unnecessary travelling and commuting and to use services instead of physical products"* (Private discussion).

This thesis doesn't analyze the network infrastructure in a broad scale, but it must be mentioned that the energy demands of the network create a heavy environmental burden. This is set to continue to grow significantly with the advent of third generation mobile networks, and beyond. 3G requires an increased density of base stations due to increasing data intensity, in addition to general growth in the mobile network across geographies (Forum for the future, 2006; GSMA, 2009a). According to Professor Jukka Manner: *"As people want more digital services and content, the crucial question is where does this data come from, how it is transferred, consumed and generated? When looking at energy used for mobiles phones, we need to look at the whole ICT infrastructure and its many parts which make mobile phones to function. This includes data centres, routers, radio transceivers and sensors, etc. The growing needs of mobile phones demand more energy. Earlier it was necessary to charge a mobile phone around once a week, but now it is not unusual to have to charge it daily. This is because of more intense usage and massive growth in data transfer. Another important question is how to capture and reuse the energy the data centres produce"* (Private Discussion).

Up to 50 percent of an average air-cooled data centre's energy consumption and carbon footprint is not caused by computing but by powering the necessary cooling systems to keep the processors from overheating and the situation is far from optimal when looking at energy efficiency from a holistic perspective. However, there are already advances in building energy efficient data centres. IBM has delivered a first-of-a-kind hot water-cooled supercomputer Aquasar.marking a new era in energy-aware computing. It consumes up to 40% less energy than a comparable air-cooled machine. In addition, the surplus energy is used for other purposes in the community, e.g. heating the university buildings. Aquasar's carbon footprint is reduced by up to 85 % (IBM, 2010).

However, a decrease in power consumption of mobile networks per user is expected, owing to the adoption of efficiency measures (GSMA, 2009a). For example, Nokia Siemens Networks "Flexi Base Station" is claimed to be one of the most energy efficient base station on the market providing up to a 70% reduction in site energy costs. It is only 20% of the size and weight of traditional network equipment. Also wind and solar power provides an alternative to mains grid electricity for the powering of base stations, and according to GSMA reduce operator carbon emissions by an average 4,580kg of CO2 per site per year (GSMA, 2007). According to Esa Kemppinen, a business developer in Nokia Siemens Networks' sustainability operations: *"In the rural areas of developing countries people can charge*

mobile phones ecologically, even for free, at a local off-grid radio base station where renewable energy sources have been used to produce electricity" (Private discussion).

5.7.3 Mobiles for sustainable consumption

As mentioned in the beginning of this chapter, ICT's largest influence is to enable energy efficiency in other sectors. ICT is in a unique position for encouraging a change in behaviour by helping to make environmentally sustainable decisions e.g. by enabling new ways of working and transforming behaviour and purchase decisions by providing digital alternatives instead of physical products. Digital alternatives are also cheaper, which is an advantage especially for low-income consumers.

Mobiles can be used for calculating carbon footprints. Measuring the impact is important as for reducing emissions one has to manage them, and to manage them, one needs to measure them (The Guardian, 2008). Mobiles can improve for example smart driving; Navteq 2009 study found 8-15% fuel savings when using car navigation. Another study by European Space Agency found even more significant fuel savings up to 15-25% by using a navigator (ESA, 2009).

Talking about benefits of using a navigator in a mobile phone may seem distant from low income consumer's point of view. However even basic mobile phone models become all the time richer in features and the earlier arguments might actually be valid also for the mobile phone users in the emerging markets in the very near future.

Home energy monitoring might, at present, seem distant for the majority of emerging markets audiences. However, the possibilities mobiles can play in that field should be mentioned. Heating is the largest energy cost of the house, 86% of people said the smart meter would encourage them to turn down their heating by one degree (Energy Saving Trust, 2008, pp. 6, 9; European Commission, 2009a, pp. 15, 42).

6 Summary and conclusions

The purpose of this thesis was to examine the different benefits of mobile communications in the Base of the Pyramid (BOP) markets by creating a visual framework (Figure 12) of the benefits on the range of key impact areas and dimensions of mobility. The aim for the framework is to present a holistic picture of this wide phenomenon by answering the question: what types of benefits can mobile technology provide at the BOP markets. Research of impacts of mobility is mainly specialised according to key impact area categorisation (Economy & Finance, Politics & Democracy, Mobile-Governance, Health, Education, Social & Cultural and Environment). As the whole phenomenon of impacts of mobility is abstract and the impacts are wide reaching, a simplified framework of the phenomenon was needed. This thesis has contributed to widen the understanding of the magnitude of the whole phenomena of mobility.

The framework itself is the main result of the thesis. It visualises the wide phenomenon in a manner it can be more easily understood and approached. This thesis also helps widening the discussions of benefits and impacts of mobility, not concentrating only in some impact areas where most of the research is found such as economic impacts. The aim has been to contribute widening the theoretical discussion and theory formulation concerning the benefits of mobility.

Previous studies, as shown in this study, have demonstrated multiple benefits of mobile phones: from decreasing negative aspects (e.g., corruption, high prices because of information asymmetry, natural resource consumption, etc.) to highlighting positive aspects (e.g., education and health reach, energy efficiency, electoral oversight). However, all these impacts can be achieved only if the right levels of access and pricing are achieved. Accessibility and affordability aspects are very crucial for low income consumers in the BOP markets. Although, the focus of this thesis was the BOP markets, the framework would also work in developed countries' context to some extent. Especially as the dimensions of the key impact area environment" are fairly universal. Some dimensions can still be considered more important than others in the BOP market context:

1. Financial services (in Economic & Finance) for a simple reason as by 2012, 1.7 Billion people won't have a bank account but will have a mobile phone (CGAP, 2009, p. 1).

2. Basically all dimensions of Health and Education key impact areas because of the global shortage of 10.3 Million teachers in the world (Unesco, 2010) as well as a total deficit of 2.4 million healthcare workers worldwide (World Health Organisation, 2006). Mobile phones offer affordable way of transferring learning and health related information especially in hard-to-reach areas and over long distances.

3. Political Participation (in Politics & Democracy) as political activists are increasingly using the Internet and mobiles for mobilization. SMS (especially affordable group SMS services) has been proved to be a powerful medium for calling people to attend mass gatherings and to spread the word of mouth very quickly.

4. Electoral Oversight and Civic Engagement (in M-governance) as mobiles offer an already existing medium for reporting about different societal faults such as corruption, human rights violations or everyday local incidents such as car accidents. Mobile phones have proved to be useful also in election monitoring. A recent example comes using mobiles to monitor the 2011 Nigerian Elections (USAID, 2011).

This study also highlights 3 broader benefits of mobility in the BOP context:

1. Reach: Mobiles are empowering people by allowing similar opportunities to access to information, connecting the global world with locally relevant content as well as contributing to the development in rural and remote areas by connecting them to the world. Especially important will be connecting the next Billion people to Internet. For many of them a mobile phone will be the first and only mean of access to Internet.

2. Efficiency. Mobiles save time in many aspects by enabling virtual connectivity regardless of time or space. This aspect is also connected to environmental benefits as being able to communicate via mobiles might diminish the need to travel.

3. Dematerialisation. “All in one device” philosophy is a simple everyday innovation. It is also linked to affordability concept as a person can have e.g. a torch, calculator, alarm clock etc. in one device. This is very important aspect for the low income consumers.

Of the negative impacts of mobile technology worth mentioning are:

1. Existence and development of too many similar types of mobile services (e.g. in the field of m-banking or m-health). Usually the problem is that people don’t know enough about existing services before they start developing one of their own. It would save a lot of resources using

an existing service (especially Open Source) and then tailor it to the local context and needs. In the BOP markets this is a crucial issue as the financial resources are scarce.

2. Problem of recycling of mobiles phones in most of the BOP markets with inadequate take back/recycling system or lack of culture for recycling.

3. Possible problems with privacy issues because of GPS enabled mobile phones and Location based services.

One benefit of this thesis is also the widening of understanding of how people use mobiles and stressing that understanding people's behaviour and needs locally should be a starting point for product/service innovations. Benefits and impacts of mobility can be examined from individual's perspective, or more broadly, in the societal scope. Some benefits might be more important for the society (e.g. growth & productivity) than they are for an individual. Benefits can also be very intangible such as freedom of speech and access to information or very tangible such as receiving warnings by SMS in the emergency situations.

Dominance of benefits of mobile technology versus negative impacts raises one important question: Does the mobile technology provide wider and more profound benefits for the society than actual transactions of making calls or a general possibility of being connected? Could the mobile communications within a society to be considered as important as for example railways and postal service in terms of infrastructure or services? Is being connected considered as important public benefit as being able to move physically? Building roads and railways versus information highways?

The whole affordability aspect is also closely linked to policy makers and political decisions what is seen important in society. If mobile industry can demonstrate benefits to the society, these findings will help the industry in discussions with policymakers, for example, concerning the taxation of the industry. Governments play a crucial role in creating an enabling environment. Usually the most important players in the mobile industry are not the device manufactures, but the mobile network operators. The actual cost of a mobile device is usually not a barrier, but the cost associated with the actual usage.

What is seen important in the societies is also linked to another main concept of this thesis concerning mobility: accessibility. This is again linked to the dilemma of what is considered important? Will a government direct money to build better and further reaching communications infrastructure or is something else more important?

To ensure the access for more people into digital society, all players in the mobile ecosystem need to co-operate. There is a growing need for affordable mobile communications to meet consumer needs, especially for more innovative services and solutions for lower-income consumers. For example there is a need for mobile solutions using interactive voice response in low literacy environments.

Conclusion

Mobile communications is contributing to the convergence of globalization and transforming many aspects of our lives. It has impacted on how we work, live and, especially, communicate and socialise locally and globally. It is clear that future services and revenue growth are likely to be affected significantly by locally developed initiatives, applications and business models. The following questions are likely to dominate future thinking (Commander et al., 2010, p. 45):

- Why do service applications arise in some countries but not in others?
- How do services/applications get transmitted between countries?

Governments often want to have indicators for different impacts and play a key role in organising and funding services especially in the health and education sectors. It is assumed that governments would increasingly like to better track, calculate and communicate different developments and impacts in the society. Hence, when introducing new mobile services especially in education and health sector, it is important to understand how the services fit into the existing systems and reporting mechanisms in those fields. Finnish Mobile health expert Anneli Milen described the situation well in M4D conference in Uganda, November 2010: “bringing a new mobile tool to the picture is as adding a 3rd pedal to the bike”. So it is not only about a new mobile service and it’s target users, it is also about the local context, which always needs to be taken into account. This would also strengthen service’s legitimacy and sustainability.

Many impacts of mobile services in the BOP have been short term because the projects themselves have been short-term pilots. This is usually due to project based funding. When thinking of impacts and costs related to them, it is always necessary to keep in mind the opportunity costs: a new mobile service is probably taking funding away from something else. It is good to remember that the mobile technology isn’t always the answer for everything.

Yet, full consequences of mobile communications are to be discovered. Nearly all aspects of society are being somehow impacted by increased mobility of communication. When 5 billion people use mobile phones every day, the sheer magnitude of this phenomenon must profoundly change the functioning of societies. Mobiles have become an everyday commodity to nearly everyone in the world.

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DISCUSSIONS WITH EXPERTS:

(Those, whose comment is used in the thesis are presented by their name, otherwise only organisation and the field of expertise is mentioned):

Nokia and Nokia Siemens Network's representatives:

Ahonen, Salla. Director for Environmental Policy. Various discussions during the year 2010. Location: Espoo, Finland.

Elphinston, Gregory. Director for Corporate Social Investment, Nokia. Espoo, Finland, Various discussions during the year 2010 & 2011. Location: Espoo, Finland.

Eskelinen, Sanna. Senior Manager, Corporate Social Investment, Nokia. Espoo. Various discussions during the year 2010. Location: Espoo, Finland.

Hinkkanen, Jussi. Head of Government Relations in Middle East and Africa. Various discussions during the year 2010 & 2011. Location: South Africa.

Impiö, Jussi. Research Leader of Nokia Research Africa (NORA) in Nairobi: Various discussions during the year 2010. Location: Kenya.

Isosomppi, Pekka. Director of Social regulation, Nokia. Various discussions during the year 2010 & 2011. Location: Espoo, Finland.

Kemppinen, Esa. Business developer in Nokia Siemens Networks' sustainability operations. Various discussions during the year 2010 & 2011. Location: Espoo, Finland.

Kolehmainen, Timo. Director, Sustainability Measures & Reporting, Nokia. Espoo. Various discussions during the year 2010. Location: Espoo, Finland.

Larilahti, Anne. Head of Sustainability in Nokia Siemens Networks. Various discussions during the year 2010. Location: Espoo, Finland.

Vanhanen, Antti. Ovi Life Tools Services Rollout Manager. Various discussions during the year 2010 & 2011. Location: Espoo, Finland.

Vänskä, Riitta. Senior Manager, Learning & mobile solutions, Nokia. Espoo. Various discussions during the year 2010. Location: Espoo, Finland & South Africa.

+ 13 Nokia directors and Senior Managers in the field of Corporate Relations, Sustainability and strategy.

Discussions with external experts:

Frías-Martinez, Vanessa. PhD. Researcher at Telefónica Research. Location: Spain. Discussions during the year 2010 in Barcelona Spain September 2010 and in Kampala, Uganda November 2010.

Hellström, Johan. Researcher. Various discussions during the year 2010 in Barcelona Spain September 2010, Helsinki, Finland October 2010 and Kampala, Uganda November 2010.

Juntunen, Jouni. Researcher. Aalto University School of Economics. Discussion 7.3.2011 in Nokia Headquarters, Espoo, Finland.

Linna, Paula. Researcher. Aalto University School of Economics. Various discussions during the year 2010 and spring 2011 in Finland and Uganda.

Macoola, Jonathan. Director. Programme for accessible Health, Communication and Education (PACE). Discussion 8.11.2010 in Kampala, Uganda.

Manner, Jukka. Professor, PhD. Aalto University School of Technology. Discussion 8.3.2011 in Aalto University, Espoo, Finland.

Milén, Anneli. Senior Expert. National Institute for healh and welfare. Discussion in Kampala, Uganda November 2010.

Tedre, Matti. Professor of computer science in University of Eastern Finland and Tumaini University in Tanzania. Discussions in Barcelona Spain September 2010.

Tenhunen, Sirpa. Ph.D., Academy Researcher & an adjunct professor in Department of Social Research, University of Helsinki. Discussion 30.3.2010 in Nokia Headquarters, Espoo, Finland.

+

ETLA: 3 researchers, expertise: economic-finance. Location Finland.

GSMA: 1 expert: expertise: affordability & accessibility. Location: UK:

World Bank: 3 ICT Policy Specialists. Location USA & UK.

Ministry for Foreign Affairs, Finland: 1 ICT specialists.

VTT Technical Research Centre of Finland: 2 ICT specialists.

University of Jyväskylä: 1 Researher. Expertise: Social-Cultural.

Appendix 1.

Preliminary framework for key impact dimension of Mobility by Altura Advisers 2010

Source: Commander et al., 2010

Appendix 2. ***DRAFT May 2010 version of the Framework for key impact Areas and dimensions of mobility***