

Executive Summary

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Main messages

With some 6 billion mobile subscriptions in use worldwide, around three-quarters of the world's inhabitants now have access to a mobile phone. Mobiles are arguably the most ubiquitous modern technology: in some developing countries, more people have access to a mobile phone than to a bank account, electricity, or even clean water. Mobile communications now offer major opportunities to advance human development—from providing basic access to education or health information to making cash payments to stimulating citizen involvement in democratic processes.

The developing world is “more mobile” than the developed world. In the developed world, mobile communications have added value to legacy communication systems and have supplemented and expanded existing information flows. However, the developing world is following a different, “mobile first” development trajectory. Many mobile innovations—such as multi-SIM card phones, low-value recharges, and mobile payments—have originated in poorer countries and are spreading from there. New mobile applications that are designed locally and rooted in the realities of the developing world will be much better suited to addressing development challenges than applications transplanted from elsewhere. In particular, locally developed applications can address developing-country concerns such as digital literacy and affordability.

Mobile applications not only empower individual users, they enrich their lifestyles and livelihoods, and boost the economy as a whole. Indeed, mobile applications now make phones immensely powerful as portals to the online world. A new wave of “apps,” or smartphone applications, and “mash-ups” of services, driven by high-speed networks, social networking, online crowdsourcing, and innovation, is helping mobile phones transform the lives of people in developed and developing countries alike. The report finds that mobile applications not only empower individuals but have important cascade effects stimulating growth, entrepreneurship, and productivity throughout the economy as a whole. Mobile communications promise to do more than just give the developing world a voice. By unlocking the genie in the phone, they empower people to make their own choices and decisions.

Near ubiquity brings new opportunities. This 2012 edition of the World Bank's *Information and Communications for Development* report analyzes the growth and evolution of mobile telephony, and the rise of data-based services delivered to handheld devices, including apps. The report explores the consequences for development of the emerging “app economy.” It summarizes current thinking and seeks to inform the debate on the use of mobile phones for development. This report looks at key ecosystem-based applications in agriculture, health, financial services, employment, and government, with chapters devoted to each. The story is no

longer about the phone itself, but about how it is used, and the content and applications to which mobile phones provide access.

Engaging mobile applications for development requires an enabling “ecosystem.” Apps are software “kernels” that sit on a mobile device (typically a smartphone or tablet) and that can often interact with internet-based services to, for instance, access updates. Most apps are used by individual users, but the applications that may prove most useful for development are those usually developed within an ecosystem that involves many different players, including software developers, content providers, network operators, device manufacturers, governments, and users. Although the private sector is driving the market, social intermediaries, such as nongovernmental organizations (NGOs) play an important role in customizing applications to meet the needs of local communities. In many countries, a ready-made community of developers has already developed services based around short message service (SMS) or instant messaging (IM) and is now developing applications for more sophisticated devices. Policy-makers need to create an environment in which players can collaborate as well as compete. That will require rethinking regulations governing specific sectors such as financial services, health, or education. Governments also play a fundamental role in establishing necessary conditions in which mobile communications can thrive through the allocation of wireless spectrum, enactment of vital legislation, and leadership in mobile government, or mGovernment.

The mobile revolution is right at the start of its growth curve. Devices are becoming more powerful and cheaper. But the app economy requires economies of scale to become viable. The report argues that now is the time to evaluate what works and to move toward the commercialization, replication, and scaling up of those mobile apps that drive development. Until recently, most services using mobiles for development were based on text messaging. Now, the development of inexpensive smartphones and the spread of mobile broadband networks are transforming the range of possible applications. Several challenges lie ahead, notably, the fragmentation that arises from multiple operating systems and platforms. It is already clear, however, that the key to unleashing the power of the internet for the developing world lies in the palm of our hands.

Why are mobile phones now considered indispensable?

The report’s opening chapter provides an overview of the key trends shaping and transforming the mobile industry as well as their impact on development. The chapter examines the evolution of the mobile phone from a simple channel for voice to one for exchanging text, data, audio, and video through the internet. Given technological convergence, mobile handsets can now function as a wallet, camera, television, alarm clock, calculator, address book, calendar, newspaper, gyroscope, and navigational device combined. The latest smartphones are not just invading the computer space, they are reinventing it by offering so much more in both voice and nonvoice services.

Developing countries are increasingly well placed to exploit the benefits of mobile communications, with levels of access rising around the world. Chapter 1 explores the implications of the emergence of high-speed broadband networks in developing countries, and how the bond between mobile operators and users is loosening, as computer and internet companies invade the mobile space, with a growing number of handset models now offering Wi-Fi capability.

The chapter also examines the size and nature of the mobile economy and the emergence of new players in the mobile ecosystem. The emergence of apps, or special software on handheld devices that interacts with internet-based data services, means that the major issue for the development community today is no longer basic access to mobile phones but about what can be done with phones. More than 30 billion apps had been downloaded worldwide by early 2012, and they make for an innovative and diverse mobile landscape with a potentially large impact on the lives of people in developed and developing countries alike. Growing opportunities for small-scale software developers and local information aggregators are allowing them to develop, invent, and adapt apps to suit their individual needs. Users themselves are becoming content providers on a global scale.

Indeed, the latest generations of mobile telephony are sowing social and political as well as economic transformation. Farmers in Africa are accessing pricing information through text messages, mothers can receive medical reports on the progression of their pregnancy by phone, migrant workers can send remittances without banks. Elections are

monitored and unpopular regimes toppled with the help of mobile phones. Texting and tweeting have become part of modern vocabulary.

Mobiles are now creating unprecedented opportunities for employment, education, and entertainment in developing countries. This chapter looks beyond specific examples to identify the broader trends shaping and redefining our understanding of the word “mobile.”

A mobile green revolution

Given the dominance of primary commodities in the economies of many developing countries, chapter 2 explores the all-important area of mobile applications designed to improve incomes, productivity, and yields within the agricultural sector, which accounts for about 40 percent of the workforce and an even greater proportion of exports in many developing countries.

To date, voice calls and SMS text messages have proven invaluable in increasing efficiency in smallholder agriculture. They can, for example, provide real-time price information and improve the flow of information along the entire value chain, from producers to processors to wholesalers to retailers to consumers. The basic functions of the mobile phone will continue to remain important for reaching the widest number of people, but the focus of applications development is shifting as the underlying technologies evolve.

Today, increasingly specialized mobile services are fulfilling specific agricultural functions, while multimedia imagery is being used to overcome illiteracy and provide complex information regarding weather and climate, pest control, cultivation practices, and agricultural extension services to potentially less tech-savvy farmers. This chapter also examines the emerging uses of remote and satellite technologies that are assisting in food traceability, sensory detection, real-time reporting, and status updates from the field. It further reviews examples of mobile services in agriculture to draw key learning points and provide direction on how to capitalize on successful examples.

Mobile applications for agriculture and rural development have generally not followed any generic blueprint. They are usually designed locally and for specific target markets, with localized content specific to the languages, crop types, and farming methods. Local design offers exciting opportunities for local content and applications development but

may limit the economies of scale realizable from expanding from pilot programs into mass markets, potentially hindering the spread of new and promising applications and services.

The full scope and scale of smartphones and tablets for providing services to agricultural stakeholders have yet to emerge. An enabling environment that can promote the development and use of applications in developing countries must be prioritized to meet the information needs of the agricultural sector.

Keep using the tablets—how mobile devices are changing health care

Chapter 3 examines some of the key principles and characteristics of mobile for health (mHealth), and how mobiles are helping transform and enhance the delivery of primary and secondary health care services in developing countries. Mobile health can save money and deliver more effective health care with relatively limited resources; increasingly, it is associated with a focus on prevention of diseases and promotion of healthy lifestyles.

This chapter reviews on-the-ground implementations of medical health care apps to draw key conclusions about how mHealth can best be implemented to serve the needs of people in the developing world, as well as identifying barriers that must be overcome. It considers some of the unique features of the health care sector and the implications for medical apps in areas such as patient privacy and confidentiality, public and private provision of care, and real-time reporting requirements in crisis or emergency situations.

Modern health care systems are at a tipping point, as consumers take on greater responsibility for managing their own health care choices, and mobile phones could enable a shift in the locus of decision-making away from the state and health institutions to individual patients.

The most substantial challenge for mHealth, however, is the establishment of sustainable business models that can be replicated and scaled up. One step toward addressing this challenge might be a clearer delineation of roles within the health ecosystem between public and private health care providers. Another significant challenge is the effective monitoring and evaluation of mobiles in health, as pilot programs continue to proliferate.

Mobile money

This chapter examines the all-important topic of mobile money as a general platform and critical infrastructure underpinning other economic sectors. Mobile money has transformed the Kenyan economy, where mobile-facilitated payments now equate to a fifth of the country's gross domestic product (GDP). The impact of mobile money is widening elsewhere too, as it is adopted across commerce, health insurance, agricultural banking, and other sectors. Today, the potential of mobile payment systems to “bank the unbanked” and empower the poor through improved access to finance and lower transaction costs is generating growing excitement. Where they exist, mature mobile money systems have often spun off innovative products and services in insurance, credit, and savings.

When connected on a large scale, evidence suggests that the poor are able to use mobile money to improve their livelihoods. Observers remain divided, however, about whether mobile money systems are fulfilling their true growth potential. Innovative offerings, old and new, can succeed only if there is sufficient demand from consumers and firms—a variable missing in many contexts.

The mobile money industry exists at the intersection of banking and telecommunications, embracing a diverse set of stakeholders, including mobile operators, financial services companies, and new entrants (such as payment card firms). In some countries, mobile money systems may be subject to different regulatory practices and interoperability issues, not to mention clashes in culture between banks and mobile operators, so developing the necessary cross-sectoral partnerships can prove difficult. In other countries, well-developed alternative legacy systems are strong competitors to the development of mobile money systems.

This chapter evaluates the benefits and potential impact of mobile money, especially for promoting financial inclusion in the developing world. It provides an overview of the key factors driving the growth of mobile money services, while considering some of the barriers and obstacles hindering their deployment. Finally, it identifies emerging issues that the industry will face over the coming years.

Get a phone, get a job, start a business

The global mobile industry is today a major source of employment opportunities, on both the supply and demand

side. Employment opportunities in the mobile industry can be categorized as direct jobs, indirect jobs, and jobs on the demand side. The contribution of the mobile communication sector to employment and entrepreneurship to date is difficult to assess, however, because the seemingly simple mobile phone can generate—and occasionally eliminate—employment opportunities by creating efficiencies and lowering transaction and information costs.

The recent rapid innovation in the mobile sector has generated significant disruptive technological change and uncertainty. This turmoil is also lowering barriers to entry, however, and generating fresh opportunities for small and young firms and entrepreneurs to displace legacy systems, innovate, and grow.

Chapter 5 showcases some of the mechanisms by which the mobile sector supports entrepreneurship and job creation. Some share similarities with traditional donor initiatives, but many are novel ideas, for which the “proof of concept” has been demonstrated only recently or has yet to be demonstrated. This chapter considers the use of specialized business incubators or mobile labs (mLabs) for supporting entrepreneurial activity in the mobile industry, as well as new opportunities that are offered in areas such as the virtual economy (trading goods and services that exist only online) or mobile microwork (work carried out remotely on a mobile device, on micro-tasks, such as tagging images).

It also provides suggestions on how to support entrepreneurship and job creation in the mobile industry. In an industry evolving as quickly as the mobile sector is today, it is vital to tailor support to local circumstances and to evaluate impact regularly.

Using phones to bring governments and citizens closer

In the public sphere, mobiles now serve as vehicles for improved service delivery and greater transparency and accountability. Today, governments are beginning to embrace the potential for mobile phones to put public services literally into the pocket of each citizen, create interactive services, and promote accountable and transparent governance.

Chapter 6 identifies a range of uses for mobiles in government (mGovernment) that supplement existing public services, expand their user base, and generate spin-off services. The revolutionary aspect to mGovernment lies in making government available, anytime and anywhere, to

anyone. The chapter also provides a range of examples of mGovernment from around the world as well as a range of best practices and recommendations. It demonstrates how countries can play a constructive role in enhancing sustainability and enabling scale, while maximizing the impact of mGovernment programs.

An important conclusion is that bottom-up ad hoc approaches to mGovernment may endanger economies of scale. Top-down coordinated approaches may be preferable, since they can cut costs in designing, deploying, and operating apps; consolidate demand for communication services across government, thereby eliminating duplication; and include focused actions to build capacity and skills.

Emerging best practices suggest that any government considering the opportunities inherent in mGovernment should focus on enabling technological transformation and building the institutional capacity needed to respond to citizens' demands. Governments looking to adopt mobile tools to become responsive, accountable, and transparent should bear in mind that this process will prove successful and truly transform the government-citizen relationship only when governments take into account both elements—"mobile" and "government."

Onward and upward to mobile broadband

Chapter 7 distinguishes between supply-side policies (which seek to promote the expansion of wireless broadband networks) and demand-side policies (which seek to boost adoption of wireless broadband services) in the mobile broadband ecosystem.

Supply-side policies seek to address bottlenecks and market failures that constrain network expansion and provide incentives for broader wireless broadband coverage. The chapter reviews the following supply-side policy recommendations:

- Boosting the availability of quality spectrum to deploy cost-effective wireless broadband networks
- Eliminating technological or service restrictions on spectrum
- Focusing on expanding network coverage rather than on profiting from spectrum auctions
- Requiring transparency in traffic management and safeguarding competition

- Limiting spectrum hoarding, which could distort competitive conditions in the market
- Fostering the development of national backbone broadband networks
- Encouraging infrastructure and spectrum sharing

Demand-side policies aim at boosting growth in the adoption of wireless broadband services by addressing barriers to adoption and fostering the development of innovative broadband services and applications pulling users' demand toward mobile broadband. The chapter reviews the following demand-side policy recommendations:

- Improving the availability and affordability of broadband-enabled devices
- Boosting the affordability of broadband services
- Fostering the development of broadband services and applications

The chapter concludes that appropriate policy action requires addressing both the supply- and demand-sides of the mobile broadband ecosystem. Policy-makers must evaluate local market conditions before applying specific policies addressing bottlenecks or market failures. The most common breakdowns on the supply side are lack of available spectrum and inadequate backbone networks; on the demand side, the main constraints are lack of affordable mobile devices and broadband services, as well as limited local applications and content. Ultimately, policy-makers must determine which policies to adopt, and how to implement them, based on domestic circumstances and the likely effectiveness of the policy for broadband diffusion in the context of each country.

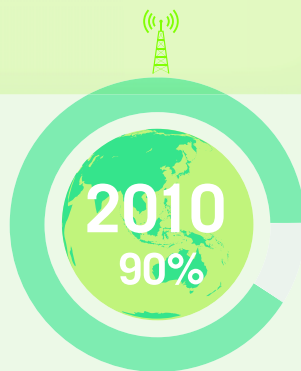
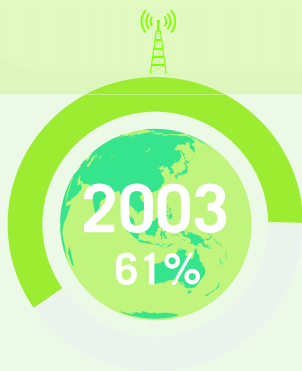
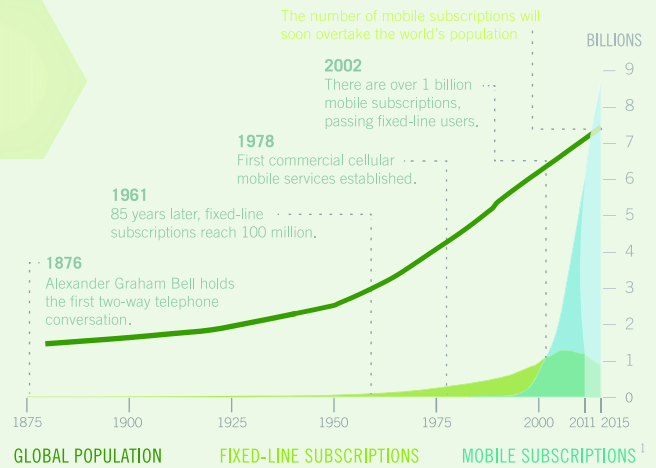
Appendixes

The *Country Tables* in the appendix to this report provide comparative data for some 152 economies with populations of more than 1 million and summary data for others, with at-a-glance tables focusing on the mobile sector. The report is complemented by the World Bank's annual *Little Data Book on Information and Communication Technology*, which presents a wider range of ICT data.

The Statistical Appendix reviews the main trends shaping the sector and introduces a new analytical tool for tracking the progress of economies at different levels of economic development in widening access, improving supply, and stimulating demand for mobile services.

MAXIMIZING MOBILE FOR DEVELOPMENT

THE PACE AT WHICH MOBILE PHONES SPREAD GLOBALLY IS UNMATCHED IN THE HISTORY OF TECHNOLOGY



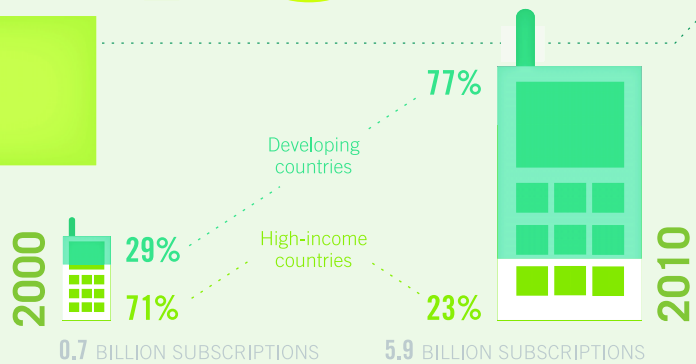
PERCENT OF THE WORLD'S POPULATION WITH MOBILE CELL SIGNAL²

OVER
6 BILLION
MOBILE SUBSCRIPTIONS
WORLDWIDE

75% of the
WORLD
NOW HAS ACCESS
to a MOBILE PHONE³

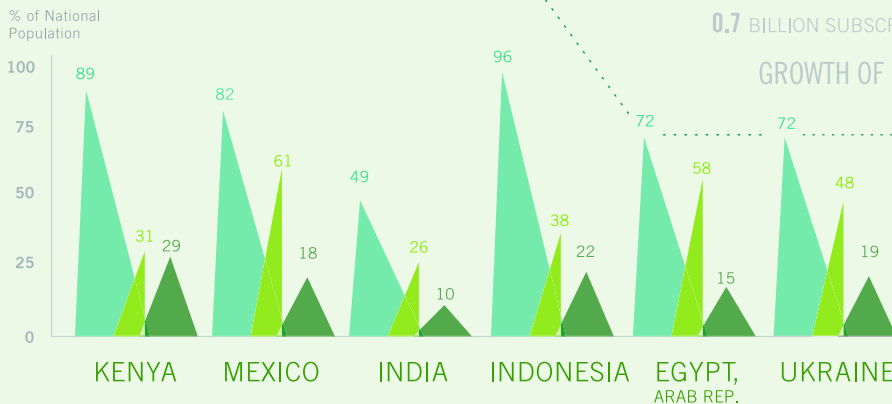
THE DEVELOPING WORLD IS NOW
MORE MOBILE THAN THE DEVELOPED WORLD

MOST PHONES ARE OWNED BY PEOPLE
LIVING IN LOW-INCOME REGIONS



GROWTH OF GLOBAL MOBILE SUBSCRIPTIONS⁴

ACCESS TO A RANGE OF MOBILE APPLICATIONS HAS **INCREASED DRAMATICALLY** THROUGHOUT THE LAST DECADE



RISE OF NON-VOICE MOBILE USAGE in 2011⁵

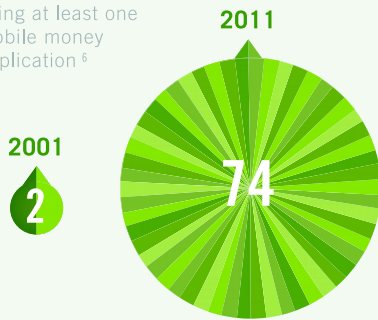
Send text messages Take pictures or video with a mobile Use mobile internet

NEAR UBIQUITY BRINGS NEW OPPORTUNITIES

FROM SMS TO SMARTPHONE APPS, **VIRTUALLY ENDLESS APPLICATIONS** ARE NOW AVAILABLE TO USERS IN DEVELOPING COUNTRIES.

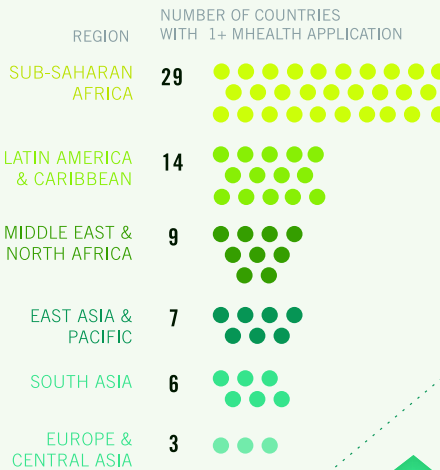
MOBILE MONEY

Number of countries using at least one mobile money application ⁶



MOBILE HEALTH

Number of countries using at least one mHealth application ⁷



MOBILE APPLICATIONS NOT ONLY EMPOWER INDIVIDUAL USERS, THEY ENRICH THEIR LIFESTYLES AND LIVELIHOODS, AND BOOST THE ECONOMY AS A WHOLE.

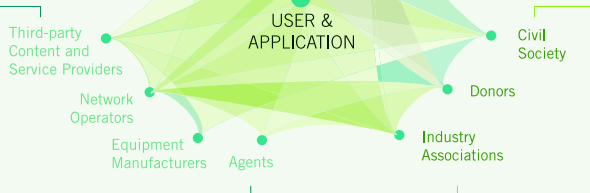


GOVERNANCE

Regulators Policy-makers

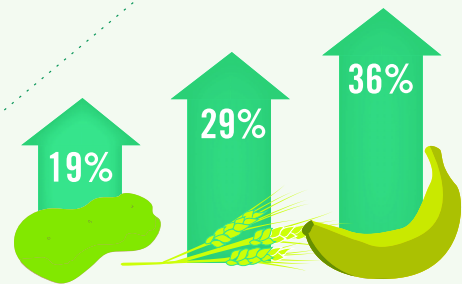


INDUSTRY



SUPPORT

Making a development impact requires collaboration.



INDIA potato farmers
NIGER grain traders
UGANDA banana farmers

INCOME GROWTH OF FARMERS + TRADERS WITH MOBILE APPLICATION USAGE ⁸

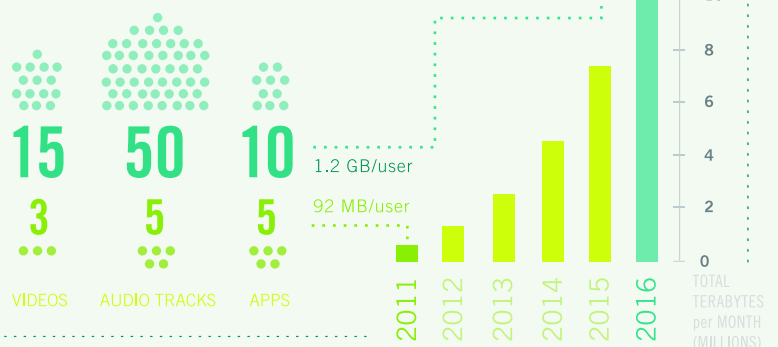
ENGAGING MOBILE APPLICATIONS FOR DEVELOPMENT REQUIRES **AN ENABLING ECOSYSTEM**

ECOSYSTEM FOR MOBILE APPLICATION DEVELOPMENT

Mobile devices are becoming cheaper and more powerful, while networks are doubling in bandwidth roughly every 18 months and expanding into rural areas.

THE MOBILE REVOLUTION IS **RIGHT AT THE START** OF ITS GROWTH CURVE

GLOBAL FORECAST FOR MOBILE DATA TRAFFIC⁹



Sources

1. ITU estimates, UN, 2010.
2. ITU, 2012.
3. World Bank estimate.
4. ITU estimates.
5. Pew Research Center, 2011.
6. GSMA Mobile Money Tracker, 2012.
7. Adapted from GSMA mHealth Tracker, 2012.
8. Dixie and Jayaraman, 2011.
9. Cisco, 2012.