

The Global Digital Divide and Mobile Business Models: Identifying Viable Patterns of e-Development

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Abstract

Capabilities for accessing, delivering, and exchanging information in digital forms vary greatly across the rich and the poor nations. Mobile networks can reach quickly into regions where fixed networks are slow to emerge and thus offer the potential to bridge the global digital divide. The ultimate success of these “mobile e-Development” or MED models, however, will depend on a variety of contextual factors shaped by specific aspects of technology, economy, politics, regulation, and culture. This paper attempts to provide an insight into the mechanisms by which these contextual factors are likely to influence the penetration and the degree and types of mobile phone use. Two cases are presented to illustrate how the environmental forces are shaping the development of mobile markets in Asian countries.

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Introduction

Rich and poor nations vary greatly in their capabilities for accessing, delivering, and exchanging information in digital forms. Mobile telecommunications networks have been touted as “leapfrogging alternatives” that can allow developing nations to close, or at least narrow, the “digital divide” between the developed and the developing world, and within the developing nations themselves. Thus, according to the International Labor Organization (ILO 2001):

[A]cceleration of development can occur through the leapfrogging potentials inherent in the technologies, where leapfrogging is defined as the ability to bypass earlier investments in the time or cost of development. Leapfrogging has first of all a technological foundation: through wireless applications, developing countries can bypass more costly and time-consuming investments in fixed-wire telecom infrastructures.

Until a few years ago, mobile phones diffused more rapidly in high-income countries and widened the digital divide between the developed and developing countries (UNDP 2001). In recent years, mobile communications are experiencing higher growth rates in low-income countries. For instance, during 1995-98, mobile subscribers in low-income countries registered a annual percentage growth rate of 117% compared to a rate of 47% for high-income countries during the same period (ITU 1999a). As a result, from 1990 to 1999 the developing countries’ share in the world mobile market increased from 5 per cent to 20 per cent and that of the Asia-Pacific region rose from 15 to 20 per cent (Wai 2001). More importantly, a large proportion of the newly added mobile phones in

developing countries are getting into the hands of relatively poor people (Economist 1999).

While the above statistics suggest that mobile networks are reaching quickly into regions where fixed line networks are slow to emerge, the ultimate success of these “mobile e-Development” or MED models will depend on a variety of contextual factors shaped by specific aspects of technology, economy, politics, regulation, and culture. A deeper understanding of the mechanisms by which these environmental factors influence the degree and types of mobile phone uses would help formulate appropriate policies to increase the mobile penetration in developing countries and narrow the existing global digital divide.

Drawing from macro-level data as well as two case studies, this paper presents a meta-model of which mobile telecom business models may “work” in various development settings. In our view a “mobile e-Development” or MED model “works” when it creates the projected socioeconomic changes – the sought-for “development” impact – as well as generates political-economic payoffs for the development agencies and firms that sponsor and implement the model.

The remainder of the paper is organized as follows. The following section presents our proposed MED model. It is followed by an analysis of several current and possible uses of mobile phones and the impact of environmental factors on the degree and types of mobile phone uses. Then, we relate the MED model to the elements of existing theories on innovation diffusion and attempt to provide some mechanisms by which mobile diffusion can be accelerated in developing countries. Next, we provide two cases

to illustrate how contextual factors can shape the degree and types of mobile phones use. Finally some conclusions are provided.

The Proposed MED Model

Figure 1 represents our proposed Mobile e-Development (MED) Model. The essence of our model is that the degree and types of uses of mobile phones are influenced by a number of forces in the environment including political, cultural, and economic factors. The success of a firm's mobile e-commerce model is, thus, a function of its ability to identify and align with the mechanisms that spur mobile telecommunications adoption and usage. Conversely, policies that fail to consider the impact of the contextual factors will not be very effective in bridging the existing digital divide.

Figure 1 here

Influence of Environmental Factors on the Degree and Types of Mobile Phone Uses

Mobile technologies are having a big social and economic impact in many developing countries. Farmers, fishermen, small business owners, and ordinary people are using mobile phones to perform a number of activities and several m-business models are evolving. First and foremost, mobile phones have enabled small business owners in developing countries to promote their products and communicate with their customers effectively. In Johannesburg, South Africa, for instance, one can see many homemade signs in the streets with mobile phone numbers which offer services ranging from house

painting to gardening (The Economist 1999). As Lopez (2000) observes “huge billboard ads in Africa have made mobile phones as popular there as Coca-Cola.”

Second, mobile phones have lowered the risk of the profit margins of farmers and small business owners in developing countries being squeezed by larger firms or the firms from developed countries¹. Farmers in developing countries are using mobile phones to eliminate or reduce the role of intermediaries in the value chain. For example, mobile phones have enabled Bangladeshi farmers to find the proper prices of rice and vegetables. Similarly, groups of small farmers in remote areas of Côte d’Ivoire share mobile telephones so they can follow hourly fluctuations in coffee and cocoa prices. Thanks to mobile phones, they can now choose the time to sell their crops when world prices are in their favor. A few years ago, the only way to find out about the market trends was to go to the capital city and most of the times, the deal making was based on often-unreliable information from buyers (Lopez 2000). Likewise, fishermen in India use mobile phones to get information about the price of fish at various neighboring ports before making decisions about where to land their catch (Rai 2001).

Third, mobile phones have positively contributed to efficiency and competitiveness of small business owners. For instance, mobile phones have made taxis in Kampala, the Ugandan capital, more efficient. Similarly, tradesmen traveling on bicycles in Jamaica use mobile phones to communicate with their suppliers and customers (The World Bank 2000b).

¹ In the case of international trade, Avinash Persaud argues that e-commerce has shifted power from sellers to buyers. Most farmers from developing countries are commodity producers that come low down in the supply chain, and firms from developed countries are likely to squeeze their profit margins (see Economist.com 2000)

Fourth, mobile phones have reduced the cost of doing business and helped increase the yields of farmers by providing safety. ITU (1999b) documents how the driver and his colleagues of a van laden with readymade garments that met an accident in Chittagong, Bangladesh used a mobile phone to avoid the risk of their consignments being looted. Similarly, in Lubumbashi, Southeastern Democratic Republic of Congo, maize farmers give mobile phones to their security guards, which has been an effective measure against robbery and increased the yields significantly (Lopez 2000).

Fifth, mobile phones have been used in e-government and civic participation as well. During the 2000 elections in Senegal, for instance, FM radio reporters used mobile phones to improve their coverage (Lopez 2000).

Sixth, mobile sets in developing countries are being used for e-commerce activities, which have increased the convenience of shopping at home. For instance, mobile phones are more popular than fixed lines connected to the Internet for buying and selling stocks online in some Chinese cities.

Finally, mobile phones are delivering and have the potential to deliver a number of other social benefits. They can help families and friends stay in touch, improve education and medical benefits to rural and remote areas through distance learning and telemedicine (for example, see Hammond 2001), etc. For example, people in rural Bangladesh, who had virtually no phones until a few years ago, are using mobile phones to call their family members staying abroad or in other parts of the country, call doctors or the police for emergencies, etc. (Schwartz 2001). Also mobile data networks are being used for such purposes. In Uganda, despite limited bandwidth, GSM telecommunications

are being used to provide Internet access and even high frequency radio is used to provide email connectivity (Ernberg 1998).

Developing countries across the world, however, are characterized by a high degree of heterogeneity in terms of mobile phone penetration and the degree and type of mobile phone uses. The heterogeneity is the result of the interaction of a number of contextual factors.

Cultural factors

First, cultural factors influence whether mobile phones or fixed phones are preferred. In particular, Asians exhibit a higher level of preference for mobile phones than their counterparts in Europe or America. As Ken Hyers, an m-commerce analyst for Cahners observes, people in Asia are more “comfortable with a lot of different, small electronic devices and appear to be more comfortable with wireless phones” (Wilson 2001).

Second, cultural factors influence the propensity to share mobile phones in the community. In some African countries, for example, although a mobile phone nominally belongs to a person, it is regarded as the property of the community, because of the culture of sharing the tools of communication (Lopez 2000). If the people in these countries were as individualistic as those in Western countries, at the current level of penetration rates the social benefits of mobile phones would have been much lower. In these countries, the children of the owners of mobile phones often run to neighbors to tell them that a relative living abroad will be calling back in a few minutes.

Third, cultural factors also influence the types of uses of mobile phones. Mobile phones have minimized the perceived insecurities and danger for females in several

developing countries. For instance, Lopez (2000) reports a Venezuelan saying: “My daughter never goes out at night without her mobile. I can call her every hour or less to see if she’s OK”.

Fourth, cultural values determine appropriateness of the contents in mobile Internet. The sites most favored by I-mode users in Japan, for example, deal with such trivialities as downloadable Pokemon characters or call melodies that “may not cut ice elsewhere” (Ebusinessforum.com 2001).

Policy related factors

Availability of mobile phones is at least as much a political problem as it is an economic one. Policy related factors have direct as well as indirect influence on mobile penetration and the degree and types of mobile phones. If governments are willing to open the mobile market for competition and make investment in mobile projects, the availability of mobile phones can increase dramatically with consequent decreases in price. European governments, for instance, experienced a financial windfall by auctioning off 3G mobile licenses. The experience of developing countries that have opened their mobile markets, such as Korea and Sri Lanka, indicates that competition among operators leads to lower prices (UNDP 2001). Other developing countries can learn from such experiences and open the market for competition to balance the power of state run monopolies. India, for instance, opened its telecom market for competition and is experiencing a rapid growth rate in mobile penetration (Rai 2001).

Governments’ willingness to open the market for competition and make investment in mobile sector, in turn, is partly influenced by their perception about the appropriateness and usefulness of mobile phones for different sections of the society.

Many governments still view mobile phones as luxury items appropriate only for business executives and rich people; and this has become a major obstacle in bringing mobile communications to the least developed areas (Lopez 2000). As illustrated in the GrameenPhone case later in this paper, the project of providing mobile phones to rural Bangladeshi people was not well received initially by the development agencies and telecommunications companies.

Government policies also influence the availability and the content of mobile Internet. Lack of suitable portals and specialized sites in developing country is hampering the development of mobile Internet in these countries.

International level policies

International organizations such as International Telecommunications Union (ITU) and World Bank are taking initiatives to increase mobile phone penetration in developing countries and helping at least to control the growth rate of the digital divide between the developed and developing countries. For instance, WorldTel is an investment venture launched by the ITU and organized according to business principles. WorldTel was set up to help businesses identify and execute profitable telecom investment opportunities in developing countries. Leading handset makers and service providers such as AT&T, Cable and Wireless, NEC and Nokia have expressed interest in WorldTel, which expects to realize real rates of return on equity of 25 per cent or more (Garcia and Gorenflo 2001).

ITU is also working to develop a single global standard for mobile communications. The economies of scale achievable with a single global standard would

drive down the price of terminals and services to the user, boosting the penetration of mobile phones in developing countries (ITU 2000).

International institutions are also influencing national governments to raise the level of competition in telecom sector in general and mobile sector in particular, thereby increasing the availability of high quality mobile phones and services at low prices. For instance, thirteen developing countries signed the Information Technology Agreements (ITA) under the WTO to eliminate customs duties on seven broad categories of products including computer hardware, computer software, telecom conductor, and switching equipment. Most of the countries have shown full or partial success from such moves (Bhatnagar 1999).

Economic factors

Economic factors also influence the level and types of mobile uses in a number of ways. First, purchasing power of people is one of the important determinants of the mobile penetration rates.

Second, the contribution of high technology in the gross domestic product (GDP) of countries determines the extent to which mobile sets are available or imported in developing countries. High technology contributes a relatively high proportion of GDP in some developing countries such as China, Malaysia and Thailand and mobile sets are likely to be cheaper and easily available in these countries. Many developing countries do not produce mobile sets domestically. Tariff and non-tariff barriers often make mobile phones expensive and unavailable in such countries.

Third, economic factors determine the activities for which mobile phones are likely to be used. Mobile phones in developing countries, for instance, are being used in such activities as buying and selling stocks online, protecting maize farms from robbery, and tracking world prices of agricultural products.

Fourth, price structure and availability of fixed lines and computers influence the uses of mobile phones. As illustrated in the GW Trade case in the next section, the high prices of fixed line Internet access and computer have been the major driving forces for making GW Trade's "netset" a big hit in some Chinese cities.

Mobile technology effect

Several characteristics of mobile technology make it an attractive option for narrowing the digital divide. These characteristics include:

- Ability to overcome geographic barriers caused by rugged mountains, wet and swampy ground, deserts, etc.
- Shorter payback period of mobile telecom projects compared to fixed line projects.
- Lower installation costs than fixed phones.
- Scalability (mobile phones can be deployed gradually as new customers are added simply by adding antennae as needed).
- Innovation in pricing such as pre-paid cards.
- No requirement of electricity.
- Lower social entry barriers than computer-based Internet.
- Less proneness to vandalism, theft and natural disaster than fixed phones.

Conceptual Foundations

The model presented in Figure 1 and discussed in the preceding sections is grounded in the observable and reported trends in mobile telecommunications in the developing world. While the model appears to have face validity, it needs strengthening in conceptual terms. In particular, the following issues arise:

- How does the proposed MED model relate to theories of technology diffusion and technology-based development?
- What are the specific mechanisms available to accelerate the process of development using mobile telecommunications?

MED Model in Relation to Existing Theories

Potential adopters of a technology pass through a number of stages before making acceptance or rejection decisions about the adoption of the technology. Klonglan and Coward (1970) propose a five-stage technology adoption model (TAM): awareness, information, evaluation, symbolic adoption (adoption of the ‘idea’ component of the product), and use adoption (adoption of the actual product).

Diffusion researchers have identified several characteristics of a technology that influence the speed with which potential adopters move from one stage to the next. The characteristics include relative advantage, compatibility, complexity, observability, and trialability (Rogers 1983). Perceived utility of a technology is a function of a potential adopter’s evaluation of the technology in terms of these dimensions. Some of these characteristics such as relative advantage are largely influenced by economic factors whereas other characteristics such as compatibility are largely influenced by sociocultural and political factors. A number of contextual factors in the MED model (Figure 1) affect

the diffusion pattern of mobile phones by influencing the perceived evaluation with respect to these characteristics.

The characteristics of mobile phones listed in “Mobile technology effect” box of the MED model are likely to make them more attractive than fixed phones in a number of ways. Unlike computer based Internet, mobile phones do not require electricity to operate and sophisticated skills to use, which increase their relative advantage and decrease perceived complexity. Some mobile service providers make handsets available at no or nominal costs when the subscribers sign a contract, leading to favorable assessment of mobile phones on the trialability dimension.

The way cultural values interact with mobile phones also influence the movement of a potential adopter across stages of the TAM model. Past research has suggested that cultural values are strong indicators of the degree of acceptance or rejection of technology in a society. In a review of literature on the impact of cultural factors on technology adoption, Kshetri and Cheung (2001) found that cultural factors influence how fast a potential adopter moves from one stage to the next, the usage pattern of the product, discontinuance after trial, and delay in the adoption process. Thus, people in different societies are likely to have varying levels of preference for mobile phones and are likely to use them for different purposes.

Empirical evidence also suggests the influence of political factors on the diffusion of a new technology. Rogers (1966, p.58) reports that in Vietnam it took three years to accept tilapia fish as a local diet after US technical assistance workers introduced this fish. To oppose American influence, the communists fed tilapia to sick persons and spread a rumor that the fish caused sickness. Likewise, Kshetri (2001) reported that given

their respective income levels, Internet diffusion is relatively slow in two authoritarian regimes of Asia – Malaysia and Singapore – because of the incompatibility of the Internet with the policies of the regimes. Kshetri and Dholakia (2001) found that political factors are playing an important role in the diffusion of digital signatures in Asian countries.

Past studies have also found that "market and infrastructure factors that control the availability of the innovation to potential adopters" (Brown et al 1976, p.100) influence the diffusion pattern. Manufacturers of new technological products such as mobile phones are likely to give priority to large distributors (Gatignon and Robertson 1985), which are often located in developed countries. Compounded by other unfavorable environmental factors including "physical and social barriers"(Gatignon and Robertson 1985), perceived risk of ventures is likely to be higher in developing countries than in developed countries. Multinational companies are thus likely to delay their entry to developing markets.

Mechanisms for Accelerating Development via the MED Model

One of the important challenges for policy makers involved in bridging the digital divide is to break the “hierarchical pattern” (Gatignon and Robertson 1985, p. 858) of technology diffusion, which favors developed countries. It is important to understand the “hierarchical pattern” in the case of mobile phones and to identify opportunities for leapfrogging.

International institutions and national governments can play an important role in breaking the hierarchical pattern. International institutions can influence multinational companies to channel their investment in the mobile sectors of developing countries. Such investments can be further accelerated if national governments put investor-friendly

policies in place. Merely opening the markets may not be enough to overcome these barriers. Governments in developing countries may also need to launch visible mega-projects or provide additional incentives to encourage investments in mobile telecommunications. In addition, reducing the existing tariff and non-tariff barriers to mobile phones is likely to have positive impact on mobile diffusion. Developing locally relevant applications and content can boost the perceived relative advantage of mobile phones and mobile Internet, further increasing mobile diffusion.

Policies aimed at bridging the digital divide should also consider the stages (in terms of the TAM) at which in the potential adopters are. Possible mechanisms to influence mobile adoption include:

- Making potential adopters aware of mobile phones
- Providing education about the various beneficial uses of mobile phones
- Persuading potential adopters that mobile phones are no longer the communication tools of rich people and business executives and they are increasingly being used by farmers and small business owners in several parts of the world
- Providing information about the rapidly falling costs of mobile technology.

Finally companies involved in mobile business should consider the normally adverse “hierarchical pattern” as a business opportunity to exploit. There are over four billion potential customers not yet connected to any telecom network. What is really needed is an imagination to serve this huge market profitably.

Cases

GW Trade, China

GW Trade is a joint venture between China Equity Advisory and GW.Com, a Silicon Valley-based Wireless Messaging Systems Company (Ebusinessforum.com 2000). It was established in 1994 and began technology trials in China in 1997. It is licensed to operate in the radio-frequency spectrum allocated for mobile-data transmission and manages networks to buy and sell stock online. Factors that contributed to the success of GW Trade include its innovative business model, the Chinese government's priority to develop telecom sector in general and mobile technology in particular, low computer penetration in China, and high Internet access rate via fixed lines, rapidly increasing income of Chinese people, etc.

Moreover, China has a strong potential to become a huge WAP market in Asia and GW Trade is likely to benefit a lot from the WAP market development. For instance, China's computer penetration rate is only 8.9 per 1000 people (The World Bank 2000a), whereas it has more than 100 million mobile-phone subscribers and still higher number of pager users (Stout 2001). Mobile penetration rates in larger cities are much higher than the national average. As early as in 1999, 78 per cent of the population owned cellular phones in the three wealthy cities—Beijing, Shanghai and Guangzhou— (Tsuchiyama 1999). Official projections show that China's wireless population will exceed the entire U.S. population by 2007. GW Trade's Web portal, www.byair.com, is compatible with WAP mobile telephones. It is also using "packet switching" technology for its two-way paging, which can support voice transmissions, although costs are currently high.

GW Trade sells two-way pagers in Shanghai and Shenzhen that allow users to electronically buy and sell shares. In developing countries like China, non-voice technologies have potential to offer a cheap and reliable way to transmit data that will be a viable alternative to the mobile phone. In other parts of the world, big players are not following this paging route (Holland 2000).

By March 2000, 3,000 investors in Shanghai, and 100 in Shenzhen, were trading stocks over the paging networks managed by GW Trade. The average daily volume of 3,000 Shanghai users in early-2000 was \$3.6m, about 30 times as much as the average trading volume on stockstar.com, the largest and most popular Web-based stock trading company. GW Trade's main product, the PLANET Personal Mobile Information System, is a network consisting of a messaging control center, base stations and mobile network handsets ("netsets"). Its services include two-way paging and wireless Internet e-mail. Through the netsets, individuals can subscribe to a variety of information-on-demand services, from Internet access to stock quotes. Netset users pay only a monthly service charge of about US\$5-10. Low PC penetration in China and relatively higher Internet access fees are the major factors making GW Trade's netset a big hit (Ebusinessforum.com 2000). GW Trade plans to introduce an advanced version of the pager in the near future, which will automatically broadcast real-time quotes without the user having to log on. The new version is expected to attract a large number of customers.

GrameenPhone Bangladesh

The success of GrameenPhone in Bangladesh is the result of the interaction of various contextual factors: existence of Grameen Bank to provide loans in small amount, Iqbal Quadir's innovative idea to provide mobile phones to rural people, entrepreneurial phone

ladies, and the involvement of Norwegian telephone operator, TeleNor, which provides mobile sets at breakeven prices.

GrameenPhone is a perfect example where mobile telecom and microcredit can be combined together to benefit rural people. In 1993, Bangladesh had less than two phones per thousand people and more than 100 million rural Bangladeshis had virtually no phones. When Iqbal Quadir was knitting together his project of providing mobile phones to rural Bangladeshi people, his idea was not well received by development agencies and telecommunications companies (Boyle 1998). He finally linked up with Grameen Bank, which was invented by Mohammed Yunus to loan small amounts without collateral to the Bangladeshis who were “unbankable” for other financial institutions (Chowdhury 2001).

Ninety-five percent of the loans are granted to women, the average loan being US \$24 (Schwartz 2001). These “telephone ladies” create a business by becoming a mobile phone booth. Their earning is as high as US \$500 per month, about the same level as a bank CEO in Bangladesh (Schwartz 2001). In addition to acting as phone booths, the phone ladies are also playing the role of opinion leaders.

The Norwegian state-owned telephone operator TeleNor, which owns 51 per cent of GrameenPhone, provides the handsets. They are sold for US \$250, the breakeven price. Grameen’s calculations show that each phone can make a profit of US \$2 a day, which is significantly higher than the country’s average per capita income of US \$0.60 a day. All shareholders, including Grameen Bank, also make a profit on each call. By mid-1998 about US \$100 million had already been spent by Grameen in the mobile business (Boyle 1998).

Villagers are benefiting in a number of ways by using the services provided by the telephone ladies. For instance, farmers are now able to capture more control of their businesses and are no longer at the mercy of the weather and middlemen.

Discussion and Conclusions

An important contribution of this paper is to propose the MED model, which identifies the factors that are likely to influence the degree and type of mobile phone uses in developing countries. The elements of the MED model are also analyzed in comparison to the various elements of the existing theories of adoption and diffusion.

A deeper understanding of the interaction of these factors will help formulate appropriate policy to accelerate the diffusion of mobile technologies in developing countries and bridge the existing digital divide between developing and the developed countries as well as the digital divide within developing countries. The GrameenPhone case indicates that there is in fact “market” for mobile phones even in the poorest countries like Bangladesh. As rapid technological advancements make mobile phones increasingly accessible and affordable, the only missing components in the digital dividend equation are appropriate policies on the part of the governments and imagination on the part of mobile set manufacturers and service providers.

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Figure 1: Mobile e-Development Model

