Mobile Commerce as a Solution to the Global Digital Divide: Selected Cases of e-Development

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Abstract

Capabilities of accessing, delivering, and exchanging information in digital forms vary greatly across rich and poor nations. On top of other global socio-economic disparities, we now have a growing global "digital divide." With lower fixed and operating costs, geographic flexibility, and the ability to operate without electric connections, mobile networks offer a solution to the global digital divide. We employ the term "mobile e-Development models" or MED models for economic development strategies based on mobile telecommunications and mobile commerce. Success of such MED models depends on a variety of contextual factors shaped by specific aspects of technology, economy, politics, regulation, and culture. In this chapter, we explore the mechanisms by which these contextual factors could influence the reach of mobile networks and the degree and types of mobile phone use. Two cases are presented to illustrate how environmental forces are shaping the development of mobile markets in Asian countries.

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 may allow the technologically disadvantaged segments of the world to close or at least narrow the "digital divide" that separates from the information rich. Thus, according to the International Labour 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.

During the introductory phase, mobile phones diffused rapidly in high-income countries and widened the digital divide between them and developing countries (UNDP 2001). In recent years, mobile communications are experiencing higher growth rates in

low-income countries. For instance, during 1995-2001, mobile subscribers in Africa registered a cumulative average growth rate (CAGR) of 82.1% compared to 47.8 % of the world. As a result Africa's share in the world mobile market increased from 0.7% in 1995 to 2.5% in 2001 (ITU 2002). During the same period Asia's share in the world mobile market increased from 25% to 35% (ITU 2002). 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).

Drawing from macro-level data as well as two case studies, this chapter 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 socio-economic 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. In other words, successful MED models yield dividends for target populations as well as policy sponsors.

This chapter is organized as follows. The next section discusses briefly the research questions addressed and the methodology employed. Then we outline the MED model. This 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 existing theories on innovation diffusion and elucidate 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 diffusion pattern of mobile phones. Finally some conclusions are provided.

Research questions and methodology

This chapter is guided by the following three research questions:

a) What are the benefits that mobile phones currently or potentially offer to the users in developing countries?
b) What factors influence the diffusion of mobile phones in general and their types of uses in particular?
c) What mechanisms are available to influence and accelerate the diffusion pattern of mobile phones?

In broad terms, this chapter employs interpretative epistemology and multiple case studies to construct theory about the role of mobile commerce in economic development (Montealegre 1999; Orlikowski and Baroudi 1991; Yin 1989).

The Proposed MED Model

Figure 1 outlines our Mobile e-Development (MED) Model. The essence of our model is that the ability and willingness to use mobile phones and their benefits are influenced by a number of forces in the environment. These include political, cultural, and economic forces. The success of a firm's mobile commerce efforts is, thus, a function of its ability to identify and align with the mechanisms that spur mobile telecommunications adoption and usage. Policies that fail to consider the impact of the contextual factors, on the other hand, will not be very effective in bridging the existing digital divide.

Figure 1 here

Elements of the MED Model

Benefits of mobile communications

One of the important uses of mobile phones in developing countries has been in *information search* activities. Farmers and small business owners are utilizing the information gathered via mobile phones to eliminate or reduce the role of intermediaries

in the value chain and to lower the risk of their profit margins being squeezed by larger firms or firms from developed countries[1]. 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 in the international market. Thanks to mobile phones, they can now choose the time to sell their crops when the world prices are in their favour. A few years ago, the only way to find out about the market trends was to go to the capital city and the deal making was largely based on oft-unreliable information from buyers (Lopez 2000). Similarly, fishermen in India use mobile phones to get information about the price of fish at various accessible ports before making decisions about where to land their catch (Rai 2001). Mobile data communication methods are enabling farmers to obtain and share information beyond just prices. In Costa Rica, small farmers in the field are employing HP handheld computers, equipped with simple icons, to interact with centralized databases that guide the farmers through the complex steps of growing certified organic coffee beans.[2]

Second, 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 that offer services ranging from house painting to gardening (Economist 1999). As Lopez (2000) observes "huge billboard ads in Africa have made mobile phones as popular there as Coca-Cola."

[1]Most farmers from developing countries are commodity producers that come low down in the supply chain. Since e-commerce has shifted power from sellers to buyers, corporate buyers from developed countries are likely to squeeze the profit margins of farmers from developing countries (see Economist.com 2000).

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

Fourth, mobile phones have reduced the cost of doing business and helped increase the yields of farmers and small business owners by providing *safety*. ITU (1999) documents how the driver and occupants 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 in Democratic Republic of Congo, mobile phones given by maize farmers to their security guards have been effective deterrents against robbery and increased the farm yields significantly (Lopez 2000). In addition to business safety, mobile phones are also providing social safety. Lopez (2000) reports the opinion of a Venezuelan parent: "My daughter never goes out at night without her mobile. I can call her every hour or less to see if she's OK".

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). Villagers in Uganda fire questions at Yoweri Museveni, the Ugandan president, via an FM station that the villagers contact with their mobile phones (Sebunya 2001).

Sixth, mobile sets in developing countries are being used for *e-commerce activities*, increasing the convenience of shopping at home. For instance, mobile phones

[2] See http://www.hp.com/e-inclusion/en/project/cats.html

are more popular than fixed lines connected to the Internet for buying and selling stocks online in some Chinese cities (Ebusinessforum.com 2000).

Seventh, mobile phones are delivering and have the potential to deliver a number of other *social benefits*. They enable families and friends to *communicate* with each other, improve *education*, and extend medical benefits to rural and remote areas through distance learning and *telemedicine* (Hammond 2001). For example, rural Bangladeshis use 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 email connectivity (Ernberg 1998). Mobile phones can also be used for *entertainment* activities; however, such applications are more prevalent in developed countries such as Japan.

In addition, mobile phones are creating employment and producing a number of *multiplier effects* by triggering new economic activities. The GrameenPhone case provided later in this chapter illustrates such activities.

The benefits discussed above can be realized in developing countries only when mobile phones are easily *available at reasonable price* and potential adopters are *willing* to use them. A number of contextual factors influence the *availability of and willingness to use* mobile phones.

Cultural factors affecting mobile technology use

First, cultural factors influence the level of *preference for mobile phones over fixed phones*. Asians and those from Newly Industrialized Economies (NIEs) exhibit a greater

preference for mobile phones than their counterparts in Europe or America. As an m-commerce analyst 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 belongs to a person, it is regarded as a device for the community, because of a culture of sharing of tools (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 be much lower. In these countries, the children of the owners of mobile phones often run to neighbours to tell them that a relative living abroad will be calling back in a few minutes. As indicated in the GrameenPhone case in this chapter, in Bangladesh, 70 people on the average use a single mobile phone.

Third, cultural values determine *appropriateness of the contents* in mobile Internet. The sites most favoured 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).

National level policies

Availability and price structure of mobile phone is at least as much a political issue as it is an economic one. First, *opening of mobile market for competition* can boost the growth rate of mobile adoption. The experience of developing countries such as Sri Lanka that have opened their mobile markets indicates that competition among operators leads to

lower prices (UNDP 2001). India, for instance, opened its telecom market for competition and is experiencing a rapid growth in mobile penetration rate (Rai 2001). Governments' willingness to open the market for competition and invest in mobile sector, in turn, is influenced partly by their perception of 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 chapter, the project of providing mobile phones to rural Bangladeshis was not well received initially by the development agencies and telecommunications companies.

Governments can also help accelerate the diffusion of mobile phones in an economy *by providing tax and other incentives* for mobile phone projects and by *reducing tariff and non-tariff barriers* to Information and Communication Technology (ICT) products.

In addition, government involvement in *mobile telecom projects* and making *relevant contents available* can boost mobile diffusion. Lack of suitable portals and specialized sites in developing countries is hampering the development of mobile Internet in these countries. Finally, governments can influence the diffusion of mobile phones by providing appropriate *education and training*.

International level policies

International organizations can influence the global diffusion of ICT in general (e.g., see Montealegre 1999) and mobile phones in particular in various ways. First, they can influence *national level policies* on competition, tax incentives, and tariff/non-tariff

barriers. For instance, many developing countries have eliminated or reduced customs duties on telecom and switching equipment to comply with the Information Technology Agreements (ITA) of the WTO (Bhatnagar 1999).

Second, international agencies are helping developing countries find *foreign partners for mobile telecom projects*. 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 (Garcia and Gorenflo 2001).

Third, 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).

Economic factors

First, *income and purchasing power* determine the level of investment in mobile sector as well as the economic sacrifice potential adopters can make to acquire mobile phones.

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, the types of uses of mobile phones depend upon the *economic activities* in the country. 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, *availability of related technologies and infrastructure* plays an important role in the diffusion of mobile phones. For example, the operation of mobile phone is same as fixed phones and mobile networks can be connected to fixed networks. So, potential adopters are not required to learn new skills. Moreover, formation of a critical mass of cellular phones is not necessary if there are already a large number of fixed phone users.

Mobile technology effect

Several characteristics of mobile technology make it attractive for potential adopters in developing countries (Figure 1). For instance, fixed and operating costs of mobile phones are lower than those of fixed phones; they are geographically flexible and do not require electricity to operate; and innovative mobile pricing mechanisms are emerging.

Summary of the MED model

The interrelationship among the various elements of the MED model can be summarized as follows:

- The willingness and ability of potential adopters to use mobile phones depend upon the *availability, price structure* and *attractiveness* of mobile phones as well as other *cultural factors*.

- Availability, price structure and attractiveness, in turn, are influenced directly and indirectly by *economic factors*, *national* and *international level policies*, and the *characteristics of mobile technology*.
- Taking cultural and economic factors and the characteristics of mobile technology as endogenous factors, the available *mechanisms to influence* the diffusion patterns of mobile phones are via *national* and *international level policies*.

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

Several characteristics of a technology influence its diffusion pattern: relative advantage, compatibility, complexity, observability, and trialability (Rogers 1983). Rogers (1995: 245-6) suggests that cellular phones have an "almost ideal set of perceived attributes" with respect to these dimensions. He argues that rapidly falling cost and the potential to save time (*relative advantage*), ability to connect to existing telephone network (*compatibility*), operation same as the "regular" phone (*low complexity*), status-conferral to potential buyers (*observability*), and possibility to borrow a friend's cellular phone for trial (*trialability*) drove the rapid rate of cellular phone adoption in the United States. Although the evaluation of mobile phones by potential adopters in developing countries

may differ slightly from the adopters of the U.S[3], the characteristics listed in "Mobile technology effect" (Figure 1) are likely to make them more attractive than fixed phones. Several factors lead to *high relative advantage* and *lower complexity.* The fixed and operating costs are lower than the fixed phones (see GrameenPhone case) and, unlike computer-based Internet, mobile phones do not require electricity to operate and sophisticated skills to use. Some mobile service providers make handsets available at no or nominal costs when the subscribers sign a contract, leading to favourable assessment of mobile phones on the *trialability* dimension. Norms of neighbourly sharing in developing countries also boost *trialability*.

The influence of national institutions on the diffusion of modern technologies by legal and non-legal means such as new laws, investment incentives, technology transfer, and other supply-push and demand-pull forces is well documented in the literature (e.g., King et al 1994; Montealegre 1999; Van de Ven et al 1999). With the help of numerous case histories, Van de Ven et al (1999) demonstrates that institutionalised environment plays an important role in the diffusion of new technologies. For instance, Singapore has been able to develop itself as an ICT hub of Asia by providing attractive infrastructure, skilled workers, and a stable labour environment that attracted a large number of ICT firms (Kraemer et al. 1992; Wong 1998). Strong university-industry linkages, likewise, have driven technology diffusion in Israel (Porter and Stern 2001). Similarly, privatization, competition, and trade policies have stimulated technology diffusion in Southeast Asia (Shultz and Pecotich 1997). Likewise, in the case of Scandinavian countries Dalum et al. (1988) document how public regulation and support that is

[3] For instance, potential adopters of mobile phones in developing countries may not have prior experience of using 'regular' phones.

managed to integrate new technology, skills, and existing social needs led to the rapid diffusion of mobile technology (Dalum et al 1988).

The optimum role of national institutions in influencing the diffusion of a technology, however, may depend upon the type of the technology as well as the level of economic development. As the GrameenPhone case in this chapter indicates, institutions in Bangladesh are helping to accelerate the diffusion of mobile phones by *providing loans and training to the retailers,* among other means. Such training reduces the gap between the prevailing and required knowledge about mobile phone usage and thus helps potential adopters (of mobile technology) as well as mobile retail business to move from one to the next stage of the technology adoption model (TAM).

Past studies have also found that national governments oppose ideas, products, or technologies that are against their *political goals*. Rogers (1966, p.58) reports that in Vietnam it took three years to accept tilapia fish as a local diet after U.S. technical assistance workers introduced this fish. To oppose American influence, the communists fed tilapia to sick persons and spread a rumour that the fish caused sickness. Similarly, 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 2001). Political factors, similarly, seem to play an important role in the diffusion of digital signatures in Asian countries (Kshetri and Dholakia 2001). In the case of mobile phones, governmental perceptions of mobile phones as luxury items have hindered mobile projects, including the GrameenPhone project in its initial stages.

International agencies' involvement in diverse projects aimed at enhancing economic and social well being of the people in developing countries has been widely documented. Examples include projects in areas such as irrigation (e.g., Willems 1998, Wright and Liao 1999), agriculture (e.g., Giorgio 1998) and health care (e.g., Lucas 1998). Diffusion of ICTs in developing countries can fulfil the *goals of various institutional players* in the "international relation game" in various ways. These include allowing developing countries to "leapfrog" over many stages of industrialization (McGray 1999), increasing the overall utility of the network thereby benefiting users from developed as well as developing countries (Gore 1996), and providing opportunities for interaction, learning, socialization and values exchange which could promote world peace and social justice (Fink 1997; Mansell and When 1998). Realizing such potential of ICTs, international agencies are showing an increasing level of involvement in the diffusion of ICTs in developing countries. For example, technical expertise provided by the United Nations Development Program (UNDP) played an important role in the initial phase of Peru's Internet adoption (Montealegre 1999). As shown in the GrameenPhone case in this chapter, international agencies are playing an important role in the diffusion of mobile phones in Bangladesh by providing loans and equity for the mobile projects, finding foreign partners, etc.

Diffusion researchers have also studied the impact of socio-cultural factors on the diffusion of innovations. For instance, Rothwell and Wissema (1986) point out that one of the important reasons why technologies diffused relatively slower in Ancient Greece, despite its expertise in technology and mathematics, was the easy availability of cheap slave labour, a cultural factor. Klonglan and Coward (1970) hypothesize that *sociological*

variables play more important role in the *symbolic adoption phase* (adoption of the idea component of the innovation) whereas *economic variables* play more important roles in the *use adoption phase* (adoption of the actual product). Rogers (1995) argues that cellular phones led to "status-conferral" on potential buyers (p. 246) in the U.S., resulting in favourable attitudes towards symbolic adoption. The previous section indicates that economic activities influence actual uses of the mobile phones (use adoption) for such activities as e-commerce, promotion, information search, safety, etc. Past studies have also found that *cultural factors* influence the way an *innovation is integrated* in existing ways of lives (Harris 1940). As the discussion of the elements of MED model in the previous section indicates, cultural factors have influenced the types of mobile phone uses. For instance, Japanese mobile phones are used for Samurai Romanesque, a massive multi-player online role-playing game.

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), often located in developed countries. Compounded by other unfavourable 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

The challenge for policy makers involved in bridging the digital divide is to break the trickle-down "hierarchical pattern" (Gatignon and Robertson 1985, p. 858) of technology diffusion, which favours 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 important roles in breaking the hierarchical pattern. The problem of supply constraint can be attacked if International institutions 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 such as opening markets for competition and providing tax and other incentives for mobile projects. 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 ICT products 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.

Finally companies involved in mobile businesses 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

GrameenPhone Bangladesh

The number of GrameenPhone subscribers increased from 368,000 in June 2001 (GrameenPhone.com 2001b) to 500,000 in the early 2002 (GrameenPhone.com 2002). GrameenPhone is also the fastest growing and the largest mobile phone company in the South Asia. Thanks to the rapid expansion of GrameenPhone subscribers in Bangladesh, cell phone users in the country outnumber the fixed-line telephone subscribers[4].

The GrameenPhone (GP) case shows that the trickle-down "hierarchical pattern" of technology diffusion can be effectively overcome if proper policies are put in place at various levels. The MED model indicates that national and international level policies can influence the level of investment and hence the availability and price structure of mobile phones. The Bangladeshi government liberalized telecom sector in 1995 and decided to auction cell phone operation licenses to private firms (Cohen 2001) (*national level policy*). Grameen Telecom was awarded license to access 300 kilometres of fibre route along the railway lines between Dhaka and Chittagong, to which it can connect its radio base stations (UNCTAD 1997). Three foreign telecom companies were attracted to collaborate with Grameen Telecom because of its possession of this license. The MED model also argues that providing appropriate education and training to potential adopters can accelerate mobile adoption. Governments as well as other institutions in a country can provide such education. In the case of GrameenPhone, one of the criteria for selecting a village-phone operator is that at least one member of the family knows English letters

[4] By the early 2002, there were over 650,000 mobile phone users in Bangladesh compared to 590,000 fixed-line users (GrameenPhone.com 2002).

and numbers (Quadir 2000). For those interested in become operators but lacking such knowledge, GrameenPhone provides training.

When Iqbal Quadir[5] was knitting together his project of providing mobile phones to rural Bangladeshis, his idea was not well received by development agencies and telecommunications companies (Boyle 1998). In fact government in many developing countries still view mobile phones as the communication tools of rich business people. Quadir finally linked up with Grameen Bank, established by Mohammed Yunus to loan small amounts without collateral to the Bangladeshis who were "unbankable" for other financial institutions (Chowdhury 2001).

International agencies played a crucial role in accelerating the diffusion of mobile phones in Bangladesh. Of the total $125 million initial funding of GrameenPhone, $60 million was loaned from four international agencies – International Finance Corporation (IFC), Asian Development Bank (ADB), Commonwealth Development Corporation in Britain, and Norwegian Agency for Development and Cooperation. In addition to a loan of $16.7 million, Asian Development Bank (ADB) provided an equity investment of $1.6 million (Wescott 2001). Similarly, IFC provided a $16.67 million loan and an equity investment of $1.57 million towards the company's expansion (World Bank 2001).

Mobile technology effect shown in the MED model seems to play an important role in the diffusion of mobile phones in Bangladesh. The fixed as well as variable costs of operating mobile phone services in Bangladesh are lower than those of landline phones. For example, the fixed cost to install each mobile phone for GrameenPhone came out to be $735 (Quadir 2000), which compares very favourably with International

[5] Iqbal Quadir founded GrameenPhone in collaboration with Grameen Bank of Bangladesh and Telenor AS of Norway.

Telecommunication Union's estimate of $1,300 to add one landline phone for a poor economy like Bangladesh. According to Iqbal Quadir, founder of GrameenPhone, the rural phone system, using mobile phones, is three times more profitable than urban phone systems in Bangladesh (WRI 2000). Innovations such as prepaid pricing are also driving the rapid penetration of mobile phones in Bangladesh. GrameenPhone is making its EASY pre-paid mobile phones available from many sales centres and authorized sales outlets located around the country (Grameenphone.com 2001).

The propensity to share communications tools *(cultural factor)* is another factor influencing the diffusion pattern of mobile phones. Collectivist eastern culture of Bangladesh emphasizes the welfare of a community rather than an individual. The propensity to share is also driven by economic reasons in developing countries like Bangladesh. Research indicates that each phone serves an average of nearly 70 customers in Bangladesh (Businessweek.com 2001).

This case also illustrates how mobile phones can bring multiplier effects as well as social change in developing countries. Cohen (2001), Quadir (2000) and Wescott (2001) provide several examples of such effects of mobile phones in Bangladesh.

- One woman thought of raising a large number of chickens. She could not undertake the project earlier because she was afraid that if the chickens developed diseases, she would not be able to call a veterinarian on time.
- Another woman reported that she was able save her child who was running a high fever by contacting the doctor in time.
- A man reported that he was planning to cultivate bananas on a large scale because mobile phones would enable him to obtain the market price in time to make correct selling decisions.
- Immigrant workers throughout the world with roots in Bangladeshi villages can now call home to find out how their families are doing and if the money they are sending home is indeed reaching its destination.

- Studies have found that with the increase in income and participation in family decision-making, women have become socially empowered in Bangladesh. Because villagers have to travel to the phone ladies' homes to make or receive calls, their homes have become an important place in the village. Moreover, unlike in other public places, women can go to the Village Phone Office even unescorted by a male relative.

GWCom China

Whereas the GrameenPhone case provides an insight into the factors influencing the diffusion of mobile phones in general, this case focuses on more advanced uses of mobile phones. Unlike GrameenPhone, which has at least some component of philanthropy, GWCom runs entirely on a commercial basis.

GWCom is a mobile wireless applications services provider. It launched its wireless portal byair.com[6] in 1998 to provide timely information and e-commerce capabilities such as stock trading and banking to users with mobile phone or wireless palmtop devices in the U.S. and Greater China. The company provides its networks and handheld device (netset) to individual investors.

By March 2000, byair.com had over 6,000 subscribers with the number of stocks traded as high as 3,500 daily and number of page views 250,000. By the early 2002, it delivered services to over 250,000 mobile users and more users on Information on Demand (IOD) and messaging services. GWCom users mostly use the two-way paging capability for trading stock electronically and such transaction-type services has turned out to be the 'killer application' (TDAP 2002).

[6] GWcom restructured the corporation in April 2002, dividing the business into two companies. The short messaging service (SMS) business has been renamed to byair Corporation which encompasses the mobile media services. The network business is GWcomPlanet Corporation.

GWCom's growth trajectory has been influenced by a number of factors. First, thanks to factors such as heavy investment in and reengineering of Chinese telecom sector; huge foreign investment inflow in Chinese mobile telecom sector and Chinese government's promotion of mobile phones as "people's phone" (*national level policy*), China has become the largest mobile market in the Asia-Pacific region (Kshetri and Cheung 2002)

Second, the Chinese government provided license (*national level policy*) to the company to operate in the radio-frequency spectrum allocated for mobile-data transmission.

Third, it has been able to find domestic and foreign partners to finance its growth as well as to provide relevant content. New World Infrastructure invested US$49 million in GWCom in 2000[7]. GWCom has partnered with over 30 Internet content providers and e-commerce portals in the U.S. and Greater China and connected with more than 20 securities trading firms. Moreover, China's entry in the World Trade Organization (WTO) has made conditions more favourable for finding foreign partners in its business *(international level policy)*. As a source indicates, GWCom is in the "most lucrative segment of China telecom/Internet market and best positioned to be benefit for China's entry of WTO"[8].

Fourth, the company's pricing structure made stock investment on its paging network more attractive than on the fixed network (a *mobile technology effect*). Because of low PC penetration and relatively higher Internet access fees, the only way to trade stock for a large proportion of Chinese is to read newspapers or magazines and then pick

up a phone[9]. These factors have made GWcom's web portal more attractive (Ebusinessforum.com 2000). GWCom describes its network product, PLANET, as a "high-capacity and low cost cellular packet data network that is optimized for serving wireless palm computers and PDAs"[10]. The users pay a monthly service charge of only about US$5-10. With the increasing demand, GWCom has decided to specialize in the mobile wireless data network infrastructure and outsource the equipment manufacturing to Ericsson and some Chinese vendors. This is likely to result further reduction in the price.

As indicated in the MED model, major economic activities influence the types of mobile phone uses. China's stock market is growing very fast[11] and the stock exchange companies are located in Shanghai and Shenzhen. GW Trade selected these two cities for the initial trial. Wireless users have been using GWCom's application platforms to conduct online trading since 1998 in Shanghai[12] and since 1999 in Shenzhen. In March 2000, 3,000 investors in Shanghai, and 100 in Shenzhen, were trading stocks over the paging networks managed by GWCom. The average daily volume of 3,000 Shanghai users in early-2000 was $3.6 million, about 30 times as much as the average trading volume on stockstar.com, the largest and most popular Web-based stock trading company.

This case provides additional evidence to support that *economic factors* influence the type of uses of mobile technology. In developing countries like China, non-voice

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[7] See http://www.gwcom.com/html/news0303.htm
[8] See *http://www.chinatelecomconference.com/china-dc/bio/bio13.html*
[9] See http://www.gwcom.com.cn/gwcom_news-m17.htm
[10] See http://www.chinatelecomconference.com/china-dc/bio/bio13.html
[11] See http://www.gwcom.com.cn/gwcom_news-m17.htm

technologies (such as paging) 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 such paging route (Holland 2000). The GWCom case also provides some evidence of leapfrogging potential of mobile technologies. For instance, the world's first electronic stock trading over the wireless network took place on the GWCom network in 1998 in Shanghai.

Discussion and Implications

This chapter indicates that economic factors matter but explain only a small portion of the variation in the diffusion patterns of mobile phones. Characteristics of mobile phones such as no requirement of electricity and geographical flexibility make these a more appropriate technology for developing countries. Moreover, the experience of Bangladesh indicates that per unit cost to install a mobile network is almost half that of a fixed network. Mobile technology is, thus, a better technology at a cheaper price – a perfect technology for developing countries. Recent innovations in pricing such as prepaid pricing (thus eliminating credit checks, billing, etc.) have made mobile phones more attractive, opening possibilities for faster diffusion of mobile phones.

The GrameenPhone case indicates that the potential benefits of mobile phones for rural populations can be realized if proper policies at various levels are combined with innovative ideas and entrepreneurial culture. The case also shows that, for technologies such as the mobile phones, national and international level initiatives may help overcome the conventional trickle-down "hierarchical pattern" of diffusion. The causes of rapid diffusion of mobile phone in Bangladesh identified in the GrameenPhone case, however,

[12] The world's first electronic stock trading over the wireless network took place on byair.com in Shanghai

may not be "detachable, isolable, homogeneous, independently operative, and hence susceptible of being added to or subtracted from the causal complex" (MacIver, 1964, p.94). Put differently, they cannot be "individually analysed and assessed" (Fischer 1970, p.179). Hence, a developing economy may have to implement the strategy in its own form considering the characteristics of mobile technology as well as prevailing local conditions. The MED model can provide guidance in this regard.

The discussion and cases indicate that the locus of mobile diffusion in developing countries is likely to be different from that in the developed countries in several ways. For instance, two-way pagers are popular in China whereas other developed countries are not following this route of mobile technology development. Moreover, in developed countries mobile phones are substituting the fixed phone. The skills required to use a mobile phone is the same as that required for using a fixed phone. Since mobile networks are "compatible" with fixed networks, mobile service providers are able to create a critical mass immediately. These conditions do not exist in 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. As indicated in the previous section, diffusion of mobile phones in developing countries have potential to benefit all players in the "international relations game" and hence is the right technology for international agencies to focus on. The GWCom case indicates that, apart from direct influence such as providing loans and assistance, international agencies

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in 1998 (See http://www.mobic.com/news/2000/01/gwcom_receives_capital_investmen.htm).

such as the WTO can indirectly influence mobile diffusion by making the market more competitive.

The GrameenPhone case also indicates that manufacturers and service providers have a serious lack of understanding of the unique needs of potential adopters in developing countries. For example, the case indicates that a person will be selected as the village-phone operator only if at least one member of the family knows English letters and numbers. Although GrameenPhone is providing training to those who are interested in the business, the requirement to learn English language may reduce a person's willingness to become a telephone operator. Given that there are already about 400,000 subscribers and the number is growing at an exponential rate, providing mobile telecom products and services in the local language would help accelerate mobile diffusion and at the same time boost the revenues of manufacturers and service providers.

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Figure 1: Mobile e-Development (MED) Model