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Analysing the Mobile Telecommunications Market in a Developing Country: *A Socio-Technical Perspective on Pakistan*

PING GAO & ADNAN RAFIQ

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Institute for Development Policy and Management, SED
University of Manchester, Arthur Lewis Building, Manchester, M13 9PL, UK
Tel: +44-161-275-2800/2804 Email: cdi@manchester.ac.uk
Web: http://www.manchester.ac.uk/cdi

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Ping Gao and Adnan Rafiq
Centre for Development Informatics, IDPM, SED
Arthur Lewis Building, University of Manchester, Manchester, M13 9PL, UK
ping.gao@manchester.ac.uk; adnanrafiq81@yahoo.com

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Abstract

This paper studies the dynamics of the mobile telecommunications market and the factors responsible for the deployment and growth of mobile infrastructure in the context of developing countries. Our analytical framework treats the mobile telecommunications market as a socio-technical system. Specifically, we define the telecommunications market as being composed of technology standards and three sets of social actors that include government institutions, network and service providers, and users. We show how this model can be used to analyse the telecommunications sector in developing countries by using a specific case study.

The study examines the case of Pakistan's mobile telecommunications market. It concludes that social actors together determine the adoption of standards and services, and thus shape the trajectory of the market. Our case study provides evidence that a pro-competition policy is imperative for mobile telecommunications development in developing countries, and that an independent regulator is critical in promoting technological innovation.

Introduction

Over the past two decades, the mobile telecommunications industry has grown exponentially on a global scale. For any individual country, the mobile sector has become a critical indicator of economic development (Kenny and Keremane, 2007). However, the potential of mobile telecommunications has not been fully utilised in the developing countries. As an indication, the penetration rate of mobile phones in Africa is 22%, which contrasts that of 94% in Europe (ITU, 2007). Yet, as it requires comparatively low investment, mobile technology provides a unique opportunity for the developing countries (Noll, 2000; Thompson and Garbacz, 2007). It is imperative to explore the factors that determine mobile telecommunications development in the developing world.

A lot of research efforts have been put into understanding mobile telecommunications market development. But developing countries are relatively under-studied. We lack knowledge about the characteristics of mobile telecommunications transformation in developing countries, and the social and technological factors that impact this process. As a result of the literature review on *Telecommunications Policy*, Table 1 summarises the available research on mobile telecommunications in developing countries published between 2003 and 2008. We find that all of the studies are based on secondary data; specifically statistics published by international organisations like International Telecommunication Union (ITU). Moreover, most of the research is rather outdated, examining the history before 2003. Finally, these papers focus on just one aspect of the mobile telecommunications industry, lacking a comprehensive view of its development process. This paper attempts to fill these gaps in the literature by providing a first-hand account and an holistic view of the transformation of mobile telecommunications in Pakistan over the past two decades up to 2008.

Authors	**Contribution**	**Methodology**	**Actors Studied**	**Country/ Region**	**Time Period**
Hamilton (2003)	Paper evaluates regulatory policy in 23 African countries. The author argues mobile phones are both a complement and replacement of fixed lines, especially in developing countries where competition plays a key role for telecommunications deployment.	Quantitative analysis of secondary data	Institutions (Regulation and Public Policy)	23 African countries	1985 – 1997
Lee (2003)	Auction method is a key to maximising foreign investment. The use of Anglo-Dutch format in Nigeria for GSM spectrum auction provides valuable insight for worldwide policy makers.	Qualitative data from secondary sources	Institutions	Nigeria	2001
McDowell and Lee (2003)	Requiring simultaneous coverage of rural and urban areas when awarding license helps increase penetration and achieve universal coverage.	Qualitative data from secondary sources	Institutions	India	1990 – 2003
Mureithi (2003)	Changes in regulatory framework are imperative for the development of cellular infrastructure. Enhanced	Literature review based on secondary, qualitative	Institutions (Regulator)	Africa	1993 – 2003

	competition alone may result in increased tariffs and impact penetration negatively.	data			
Rouvinen (2006)	Market competition promotes while standards competition hinders diffusion of mobile technologies. Large user base, network effect and high technological level are important for mobile infrastructure deployment in developing countries.	Quantitative analysis of secondary data	Providers and Technology	200 developed and developing countries	1992 – 2000
Vagliasindi, Guney and Taubman (2006)	Analyses exponential growth in the mobile sector and compares it with almost stagnation in land line telephony and provides strong evidence of fixed to mobile substitution effect.	Quantitative and qualitative data from secondary sources	Providers	Albania, Lithuania	2003
Garbacz and Thompson (2007)	Mobile phones are not substitutes but complements to landlines. It identifies increased competition, income growth and enhanced education as main drivers of mobile market growth.	Quantitative analysis based on secondary data	Institutions	Various developing countries	1996 – 2003
Curwen and Whalley (2008)	Liberalisation and industry restructuring leads to increased foreign direct investment and entry into the market by foreign operators thus increases competition and fosters growth.	Literature review based on secondary, qualitative data	Providers	Latin America and Africa	2003 – 2005

Table 1. Research on mobile telecommunications in developing countries

Pakistan's mobile telecommunications industry provides an interesting case to study due to its triple digit growth during the 2000s (see Figure 1 and Table 2), and the lack of research to explain it. In this paper, to identify important events in the Pakistani mobile telecommunications industry from 1990 to 2007, we have conducted 15 in-depth interviews in a semi-natural environment. Our interviewees include all the key actors in the mobile market, namely mobile operators, users and the regulators. To help us maximise recall and keep track of data, during each interview we have taken notes. Finally we were able to edit a project log and maintain a database. All interviews were recorded, transcribed, and summarised. The transcripts were then analysed based on our framework, which will be discussed later on. The findings from the interviews were corroborated through archival records.

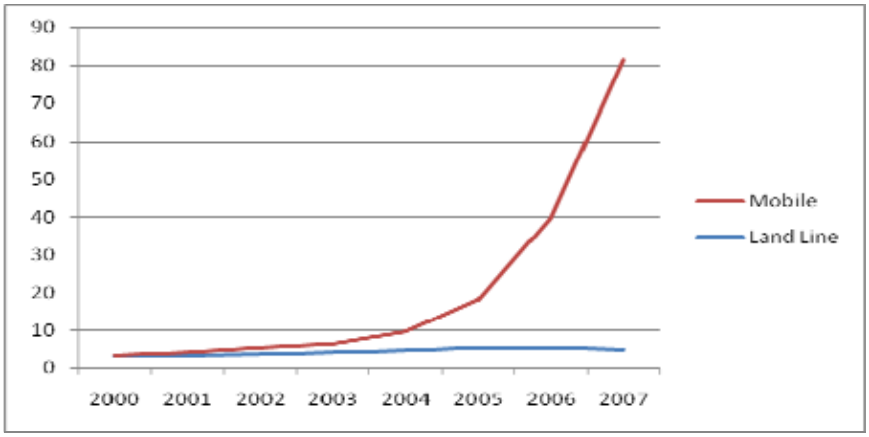

Figure 1. Number of mobile and landline subscribers in Pakistan (millions) (Source: PTA 2008)

End of Year	Number of Subscribers ('000)							Growth Rate (%, Total Market)	Mobile Tele Density (%)
	Mobilink	Ufone	Paktel (Zong)	Instaphone	Telenor	Warid	Total Market		
2000	309	117	97	220			743	142.3	0.52
2001	800	350	219	330			1,699	128.7	1.16
2002	1,115	550	319	420			2,404	41.6	1.61
2003	3,216	801	470	535			5,023	108.9	3.29
2004	7,469	2,579	924	454	836	509	12,771	154.3	8.30
2005	17,206	7,487	1,041	337	3,574	4,863	34,506	170.2	22.21
2006	26,466	14,014	1,025	333	10,701	10,620	63,160	80.7	39.94
2007	32,032	18,100	3,951	351	18,125	15,490	88,020	39.4	54.70

Table 2. Pakistan's mobile telecommunications sector (2000-2007) (Source: PTA 2008)

The paper is structured as follows. The next section defines the mobile telecommunications market and forms our theoretical framework. Drawing upon this framework, in Section B we analyze the case of Pakistan. The last section discusses the key issues by comparing the experience of Pakistan with that of some other developing countries, and concludes the paper.

A. Framework for Telecommunications Market Analysis

In all countries, the mobile telecommunications market has been transforming continuously. This transformation is characterised by the adoption of innovative technologies by the operators, the availability of new services to the users, and the involvement of various governmental institutions in the market at different times (Gao and Damsgaard, 2007). Thus, we define the mobile telecommunications market as a socio-technical system composed of two sorts of elements: mobile standards and services in the technological domain, and market players in the social domain that determine their usage. These social elements work together to promote the adoption of advanced standards and the provisions of new services, and thus market transformation (Tuomi, 2002).

Further, according to King et al (1994), the diffusion of a technology in the market is a result of the providers' push and the users' pull, subjected to the influence of relevant institutions. Accordingly, we assume that three sets of social actors play an important role in the development of the mobile telecommunications industry, namely: service and technology providers, the users or customers, and governmental institutions. Thus, we get our analytical framework as shown in Figure 2. Next, we will refer to the literature to rationalise this framework.

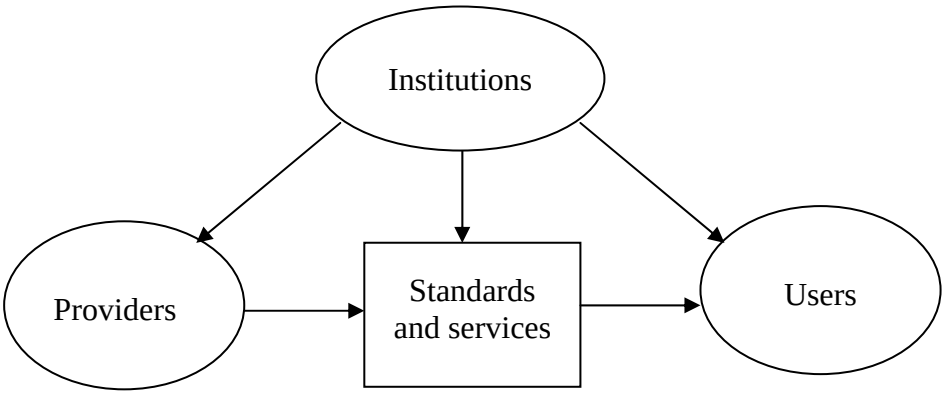

Figure 2. Components of the mobile telecommunications market

A1. Government Institutions

As specified in our framework, the first component of the mobile telecommunications market is institutions. In the literature, institutions include any kind of national or international organisations that have the ability to influence the business activities and market structure of an industry (Nelson and Nelson, 2002). In this paper we particularly focus on the regulatory regime for the mobile telecommunications industry (Koski and Kretschmer, 2005). A regulator can promote or constrain technology innovation or economic activities in various ways. One important method is through an industrial policy that sets the vision for the development of the whole industry. Specifically, such a national policy can determine the situation of market competition by supporting a monopolistic or liberalised market composition (Gruber,

2005). Other instruments for a regulator to affect the telecommunications market structure include regulatory interventions in issues such as licensing, service quality and pricing, subsidisation, interconnect charges, phone number portability, etc (Tilson and Lyytinen, 2006).

A2. Network and Service Providers

Network and service providers are key players in driving mobile telecommunications market transformation. Traditionally, mobile service providers mainly relied on voice services to generate revenue (Peppard and Rylander, 2006). Driven by technology innovation, more and more data services have appeared in the market and have become the main source of income. The provision of new data services is based on the formation of a complex value chain. The traditional mobile operators need to cooperate with other parties to develop service contents. At present, many novice actors are operating in the market, for example the mobile transactions and payment security providers, application providers, portal providers and service providers (Maitland, Bauer and Westerveld, 2002). However, in Pakistan, network operators remain the most important player in the mobile telecommunications market, taking a comprehensive role of being the service and content providers. Thus, this paper will focus on network operators.

A3. Users

Users are of course a critical component of the mobile service value chain (Maitland, Bauer and Westerveld, 2002; Peppard and Rylander, 2006). In the literature, some analysts attempt to understand customer behaviour from the perspective of technology diffusion, adoption, or domestication. The proponents of the diffusion theories see market development as a process dominated by different types of users: e.g. early adopters, early majority, laggards and non-adopters (Rogers, 1995). Scholars of the adoption school use theories such as the technology acceptance model to explain the adoption decision by consumers (Davis et al, 1989). They aim to describe the adoption process at individual levels and explore the consumer's attitude towards using mobile services (Pedersen and Ling, 2002). A third school of thought explains adoption as domestication and focuses on the application of technology in social life. In this view, mobile service usage may be simply categorised as that for work and for leisure, which stems from the fact that mobile handsets have been initially conceptualised as a business tool, and now become a leisure means (Green et al, 2001). Further, according to the degree of mobility, mobile customers can be categorised into stationary, nomadic and mobile users (Saugstrup and Henten, 2003), or travelling, visiting and wandering users (Kristoffersen and Ljungberg, 1999). Overall, factors such as culture, values, local norms and customs are seen to have a significant impact on the adoption of mobile services in a society (Barnes and Huff, 2003).

A4. Technology – Standards And Services

The last group of components of the mobile telecommunications market is technologies adopted by the mobile operators, and the services provided to the customers. The development of mobile technologies can be divided into several generations, each with improved air and network interface standards enabling better performance. Specifically, the first generation (1G) mobile technologies, e.g. the Advanced Mobile Phone System (AMPS), were introduced into the market in the early 1980s. The 1G system was based on analogue technology and hence provided relatively limited quality of communications. Moreover, the 1G network was very expensive to build, limiting its use to business purposes only (Haug, 2002). In the mid-1980s, the usefulness of digital signal processing became apparent and the second generation (2G) appeared. The most popular 2G standard was the Global System for Mobile Communications (GSM), which was established to create a pan-European mobile infrastructure allowing users to roam across country borders. GSM has since proved to be a huge success. In 2006 there were over 2 billion GSM subscribers that constituted 84% of the total mobile telephone population (GSM World, 2006). As of 2009, as the upgraded versions of GSM aimed to enable rich data services, the 2.5G standard known as General Packet Radio Service (GPRS) and the so-called 2.75G standard Enhanced Data Rates for GSM (EDGE) were operational on a global scale. 3G systems have been deployed in most countries based on two standards: Wideband Code Division Multiple Address (WCDMA) and CDMA2000. Currently the 4G standards are in the development stage. The trend of technology innovation in the mobile industry is to allow mobile phones to access the Internet and integrate with technologies like digital cameras and voice recorders (Alam and Prasad, 2008).

B. Mobile Telecommunications Transformation In Pakistan

Located in South Asia and neighboured by Afghanistan, China, India and Iran, Pakistan is the seventh most populated country in the world with a population of 160 million. Pakistan is a middle-income country with per capita income topping US$1000 in 2007 and an average GDP growth of 7% over the previous five years (MoF, 2008). Despite going through political wrangling between the military and various political and social classes, and facing constant threat of religious militarism, Pakistan has achieved fast mobile telecommunications development. As a result of triple figure growth during the 2000s, the mobile telephone penetration rate per capita jumped from 0.52% in 2000 to 54.70% in 2007. Meanwhile, the Pakistani telecommunications market has undergone dramatic transformation (Figure 1 and Table 2) (PTA, 2008).

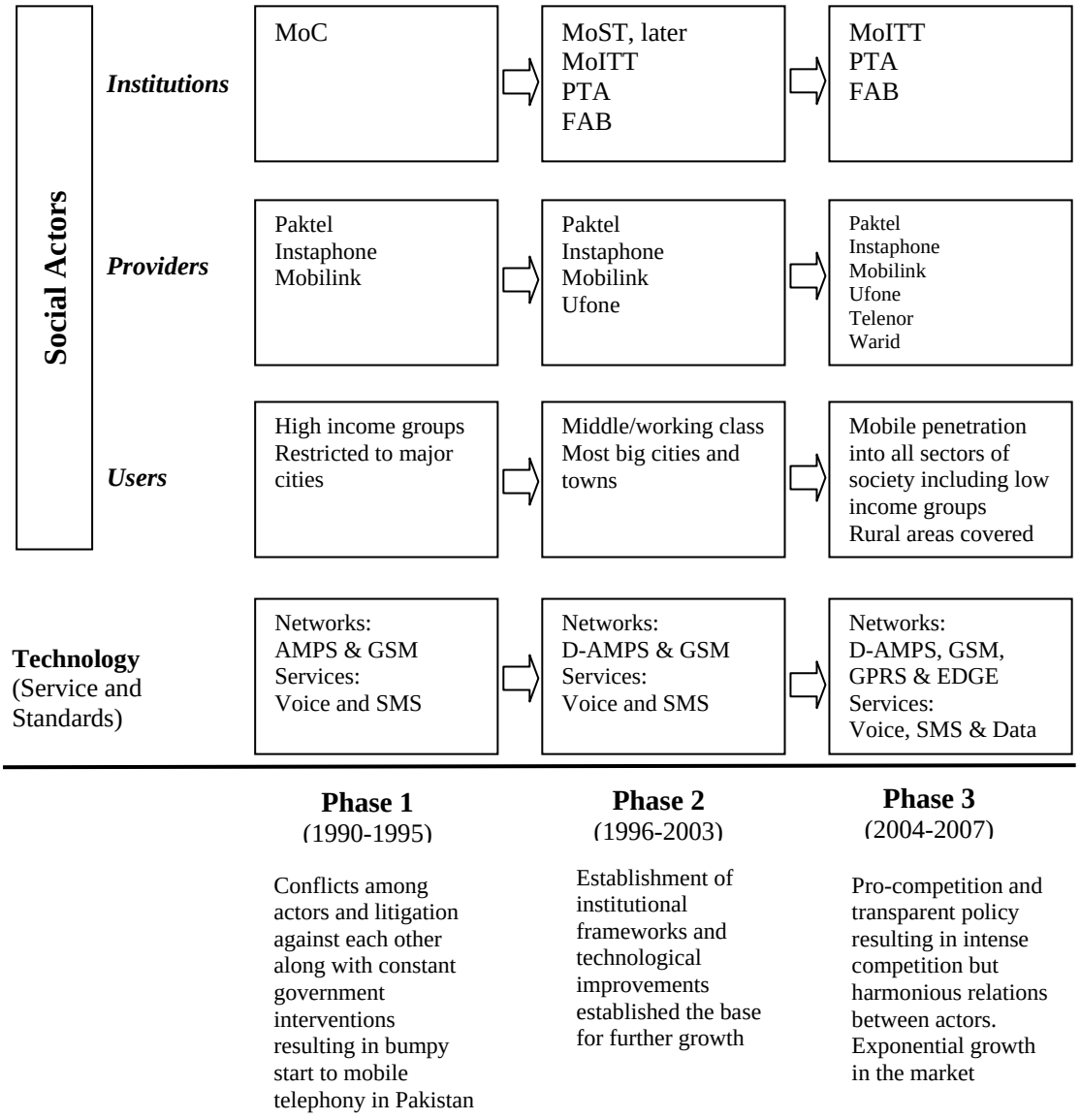

Figure 3. Pakistan's mobile market transformation by stages: technologies and social actors

Using the framework outlined in Figure 2, in this section we analyze the social and technological factors responsible for the dramatic change in Pakistan's mobile telecommunications industry from 1990 to 2007. Due to the length of the time period to be analysed, for the purpose of clear analysis the whole process of mobile telecommunications market transformation in Pakistan is divided into three distinct phases based on significant changes in national policy. Specifically, the first stage started in 1990 when the first mobile licences were issued to two private companies. The mobile telecommunications industry was in its infancy stage and under "managed competition" with frequent political interventions without a clear regulatory policy. The Telecommunications Act 1996 was a key event that moved the Pakistani mobile industry into its second phase. Since 1996, some regulatory bodies were established to oversee the development of Pakistan's mobile telecommunications sector. In 2004, the government announced a national policy committing to the creation of a competitive mobile telecommunications market. As a result of substantial liberalisation, the Pakistani mobile telecommunications industry entered into an era of exponential growth (Figure 1). Figure 3 summarises the three phases of transformation in Pakistan's mobile telecommunications industry. It shows that the relevant government institutions, technology and service providers, and customers, have played different roles in promoting the adoption of new mobile standards and the appearance of novel services in the market in different phases.

B1. 1990 – 1995: Start of the Journey

Between 1990 and 1995, in Pakistan, the fixed telephone infrastructure was monopolised by the government, while the mobile sector presented a status of "managed competition" (Hashmi, 2006). According to our framework, the smooth development of the mobile telecommunications industry depends on the establishment of an efficient regulatory regime and the support of a clear national policy, no matter it would encourage a liberalised or monopolistic market structure. In this stage, in Pakistan, the Ministry of Communications (MoC) was mandated to regulate the telecommunications sector. However, in issuing mobile licences, MoC did not have a clear policy. As a result, the mobile telecommunications market presented complications right at the start of launching mobile telephony in Pakistan. In 1990, two mobile operation licences were awarded to Instaphone and Paktel with a promise to support this duopoly for the next 15 years (Looney, 1998). However, MoC could not keep this promise due to changes in the political setup. As a result, in 1992 a third licence was issued to Mobilink which was controlled by a federal minister and headed by the son-in-law of the state President. Mobilink also had foreign support as the international giant Motorola had a share of it. Instaphone and Paktel strongly objected to Mobilink's entry into the market and the dispute ended in court (Anwer, 2006; Mufti, 2006). Eventually in 1994, Mobilink was allowed to operate the GSM network, whilst the incumbents Instaphone and Paktel could only compete with it with 1G AMPS networks (Mufti, 2006).

As argued by our framework, regulatory monitoring can substantially affect the development of the mobile telecommunications industry. In the case of Pakistan, a controversial intervention by the central government left the nascent industry disenchanted. In 1995, in a bid to improve law and order in the largest Pakistani city

Karachi, which was tormented by violent political and ethnic conflicts, the government banned all mobile services in this city. This decision meant that the 26,000 mobile subscribers (more than half of the total number of subscribers in Pakistan at that time) were disconnected from mobile networks and lost by the operators. It took two years of political bickering to lift the ban but the damage had been done in terms of stalling growth and discouraging potential foreign investors (Mufti, 2006).

As proposed by our framework, the government can impact mobile telecommunications development by taking financial measures. In Pakistan, the government levied heavy taxes on mobile services which led to a high cost for accessing them. A customer had to pay an activation tax of Rs. 7000 (US$112) to the government just to obtain a network connection. In a country with per capita income of Rs. 25,000 (US$400) at that time, this charge was too high for the overwhelming majority of people to use mobile services (Mufti, 2006).

At this stage, the government had made efforts to attract private investors into the market to offer good services to public users. However, private capital was reluctant to participate in the Pakistani mobile market that lacked an independent and fair institutional mechanism to supervise the competition. The network operators and service providers being the second set of social actors of our framework included Instaphone, Mobilink and Paktel. Originally, they were joint ventures between Pakistani firms and international telecommunications operators. In Paktel, international giant Cable & Wireless and Hassan Associates Pvt. Ltd. took 80% and 20% of the share, respectively. The multinational operator Millicom had 61.3% of the share in Instaphone along with local Arfeen Group's 38.7%. Mobilink was owned by International Wireless Communications, Motorola and the domestic Saif Group (Anwer, 2006; Haroon, 2005). These service providers focused on business customers, to whom they charged very high rates. These included one-off connection charges of Rs. 2000 (US$32), a security deposit of Rs. 10,000 to Rs. 40,000 (US$160-640) depending on the estimated usage, line rental of Rs. 300 (US$5) per month, and call charges in the range of Rs. 15 to Rs. 20 (c.US$0.30) per minute. Furthermore, the only payment method available was post payment (Mufti, 2006).

Service users are the third set of social actors of our framework. In Pakistan, the pioneering users of mobile services were the businessmen, industrialists, professionals and feudal landed politicians who belonged to the high-income group concentrated in the urban areas such as the cities of Islamabad, Karachi and Lahore. Nearly all of the users were male, and mainly in the age range of 35 to 55. At this time, though occasionally also used for business purposes, a mobile phone was conceived more as a fashion accessory and social status symbol among the rich rather than a public communications device. As one of the interviewees said: "the mobile handset was taken as a toy of the rich people" (Gulfam, 2006). Mobile services remained out of reach of the common public throughout the period from 1990 to 1996.

Thus, through joint initiatives by the government, service providers and early adopters, mobile standards and services (the technological component of our framework) were introduced in Pakistan during this period. Both Instaphone and Paktel installed a 1G AMPS network and mainly relied on voice services as the revenue source. In contrast, Mobilink gained technological superiority by establishing

a 2G GSM network. The 2G technology offered better voice services than the 1G system, and introduced SMS into the market as a low-cost alternative to phone calls. Moreover, GSM provided roaming facilities. The use of SIM cards allowed customers to switch handsets easily, or enjoy the flexibility of using different connections by changing SIM cards. The price of GSM handsets was relatively high, in the range of Rs. 25,000 to Rs. 40,000 (c.US$400-640). However, GSM phones were superior to the big black AMPS handsets that "we used to call bricks", as Mr. Moeen, Mobilink's marketing manager, put it. GSM phones offered attractive features such as colour screens, polyphonic ringtones, etc (Moeen, 2006). These technological advantages allowed Mobilink to grab 24% of the market share from its incumbent competitors by 1995, despite its late entry into the market (Instaphone held 31% and Paktel took 45% of the market share) (PTA, 2008).

B2. 1996 – 2003: Establishing the Base

Due to the lack of a clear national policy, the existence of negative government interventions, the absence of a fair regulatory mechanism, high taxes and communications charges, expensive handsets, and inflexibility of payment methods, the number of mobile subscribers in Pakistan was still limited at the end of the first stage. This section draws upon our framework to explain the development of Pakistan's mobile telecommunications industry from 1996 to 2003. In this stage, Pakistan attempted to establish key institutions and form important public policies to reshape the market structure. A significant initiative was the publication of the Telecommunications Act 1996, which provided a legal framework for deregulating the market. Through this law, the central government declared its intention to further liberalise the telecommunications sector by introducing further private capital. The law also created two institutions that were proven to be crucial in the development of the mobile infrastructure in Pakistan. Specifically, the Frequency Allocation Board (FAB) was responsible for allocating frequencies and managing the spectrum. The mission of the Pakistan Telecommunications Authority (PTA) was to protect the rights of consumers and encourage fair competition. Its responsibility included taking care of the provision of telecommunications services in Pakistan, issuing licences to telecommunications operators, and overseeing tariff setting (GoP, 1996). Due to the formation of FAB and PTA, MoC only had limited administrative function. Later in March 2000 MoC was demoted to a division of the Ministry of Science and Technology (MoST). After the 2002 election and in a new political setup, it was then transferred to the newly established Ministry of Information Technology and Telecommunications (MoITT) where it still exists today. Meanwhile, PTA was placed directly under a Cabinet Division which granted it much-needed institutional autonomy (Hashmi, 2006).

These institutional arrangements have been instrumental in establishing a base for the fast development of the mobile telecommunications industry in Pakistan (Hashmi, 2006). The contrasting priorities of the persons in charge of the Pakistani information and communications industry saw the emergence of two different yet complementary policies in Pakistan. Under the supervision of MoST headed by Dr. Atta-ur Rehman, information technology in general got a head start in the early 2000s, as indicated by the emergence of various educational institutions in information technology-related fields and the diffusion of the Internet into most cities and towns of Pakistan. Under

the leadership of Mr. Awais Khan Lagari (Minister for MoITT), the priority was shifted to the telecommunications sector. Professionalism was imported to replace the traditional bureaucratic norms. Public policy making became transparent, which was never witnessed before in the history of Pakistan. This included placing policy drafts on the ministry's website and allowing all the stakeholders to review and openly debate the policy before it was finalised. Moreover, a consultative mechanism was introduced. Some skilled telecommunications professionals from various national and international bodies gave very good guidance to Pakistan in designing telecommunications development policies (Haroon, 2005).

Facilitated by the new institutional setting, several regulatory measures were taken which substantially impacted market development. First, market competition was intensified. At the end of 2000, a license for operating GSM services was awarded to Ufone, a subsidiary of the incumbent fixed line operator PTCL (Mufti, 2006). Second, the government set the rule for the interconnection of different networks, which enabled the service providers to use new methods of communications fee collection to cater to customers. In 2001 in particular, the government enforced the introduction of the Caller Party Pays (CPP) system. This meant that customers could now enjoy free incoming calls (Moeen, 2006). Also PTA reduced the activation charges on new subscriptions first from Rs. 7000 (US$100) to Rs. 2000 (US$30) and finally to Rs. 500 (US$7) (Mufti, 2006).

In line with our framework, the new institutional setup motivated the network and service providers to be active in the mobile telecommunications market and led to the Pakistani market becoming very competitive. By the end of this period, Mobilink emerged as the market leader with 64% of the share, followed by new entrant Ufone (16%), and the previous incumbents Instaphone (11%) and Paktel (9%) (PTA, 2008). Focusing on the youth market, Ufone embarked on an effective advertisement campaign on electronic media before launching its services. Stimulated by Ufone, other operators formed a network of franchisees to take mobile services to the consumers' doorsteps. These franchisees were paid a commission on the subscriptions sold by them. They provided potential customers information on the services along with selling handsets and other accessories. This marketing measure was very effective in disseminating service information and improving the communications between service providers and the potential customers (Gilani, 2006).

As a part of its strategy to dominate the mobile telecommunications market in an environment of ever-fierce competition, Mobilink started to offer pre-paid services. Different from the traditional post-paid payment method that required customers to pay security deposits to obtain the paid connections, which met resistance from the market, this new method turned out to be a success. Following Mobilink, other service providers accepted this solution for revenue collection. It became highly popular among customers. As of 2009, well over 95% of all subscribers were on pre-paid tariffs.

In terms of the characteristics of users – the third component of our framework – in Pakistan the period from 1996 to 2003 saw that mobile services fitted with the requirement of wider sections of society as compared to the previous period. The public perception of mobile handsets began to change: they tended not to be treated as the "businessmen's tools" anymore, but a service essential for common people (Gilani,

2006). The usefulness of mobile phones now started to be realised by the public, especially the youth (Nasir, 2006). As one interviewee put it: "people walking on the footpath, talking on mobile phones started to become a familiar sight" (Gulfam, 2006). But the usage of mobile phones was still limited to the major towns and well-off areas, with males being the dominate users. Most users preferred GSM technology and were willing to switch suppliers to benefit from better deals, thus fuelling competition in the market and forcing service providers to come up with attractive offers to retain their customer base. During this period, the number of mobile subscribers increased from 68,000 in 1997 to over 5 million in 2003 (PTA, 2008).

With regards to the fourth component of our framework which is standards and services, in this period, the operators took significant strides to upgrade their networks and expand the service range. To compete with Mobilink and Ufone with GSM networks, the incumbents Instaphone and Paktel had to upgrade their networks from AMPS to D-AMPS (digital AMPS) which enabled the provision of SMS, web browsing, email and other VAS (value-added services). As a result of these efforts, Pakistan achieved 100% digitisation of its mobile networks by 2003 (Mohsin and Ishaq, 2004). Further, Paktel upgraded its network to GSM which offered an international roaming facility in 100 countries and better data services. It also planned to expand its service areas to cover an additional 150 cities across the country (Hassan, 2005). However, Paktel's plans were severely delayed due to a dispute with the PTA which demanded that Paktel purchased a new licence for GSM. Paktel was not prepared to pay the cost which was as high as US$11.1 million. The matter was finally resolved in court, and was ruled in PTA's favour. Thus, Paktel was able to launch its GSM network in 2004. However the time taken by this dispute created uncertainty about its services among customers. Its market share dropped to the smallest one of all of these operators (Khan, 2006). In this period, innovations and new features like colour screens and polyphonic ringtones etc added to the appeal of mobile phones in Pakistan, especially for the youth. Also market development was boosted by the large influx of cheap mobile phones from China that brought overall handset prices down significantly (Moeen, 2006).

B3. 2004 – 2007: Exponential Growth

Supported by initiatives such as a transparent process of policy making, independent regulator, CPP system, increased competition, reduced tariff, and different kinds of services enabled by GSM networks, by the end of the second period a somewhat sizeable user base was established in the mobile telecommunications market in Pakistan (PTA, 2008). This section uses our framework to analyse the advancement in Pakistan's mobile telecommunication industry from 2004 to 2007. First, we examine the institutional mechanism. Since 2004, the regulatory institutions were further strengthened and new strides were made on policy issues. To improve the mobile infrastructure in Pakistan, PTA decided to enhance market competition. It issued licences for the provision of mobile services in the country to two foreign companies: Al-Warid of the United Arab Emirates and Telenor of Norway. Both committed to substantial investment in the mobile network in Pakistan (Nasir, 2006). This initiative was preceded by the publication of the Cellular Mobile Policy in 2004. This policy reaffirmed the government's commitment to a competitive market and encouraged private investment in this sector. It also pledged to ensure the efficient use of the

spectrum, widen the consumer choice of services at affordable and competitive rates, and recognise service providers' rights and obligations (Hashmi, 2006). This policy prohibited the operators with Significant Market Power (SMP) from engaging in anti-competitive conduct, e.g. cross subsidisation and price manipulation. PTA was empowered to promptly investigate the allegation of anti-competitive conduct and impose remedies if such conduct was proven. Mobilink was recognised by PTA to have SMP status in the mobile market. Through the new policy, the government awarded new entrants the right of interconnection to the incumbent networks, and allowed them to co-locate exchanges in PTCL's (Ufone's parent) buildings. PTA made it mandatory for all operators to expand their networks from urban to rural areas in order to proceed towards the target of universal access to mobile communications (GoP, 2004).

Now we look at the second component of our framework: service providers. To fulfil the government requirement and also to win market share, service providers had to expand their networks to serve wider segments of customers. Companies adopted the strategies of product differentiation and focused on the niche markets. Mobilink had the largest mobile network covering more than 1,800 major cities and towns in Pakistan. While it had previously focused on the upper class, now it tried to expand its market scope. It bought the exclusive rights from the Pakistan Cricket Board for providing cricket match updates to its customers, which would certainly add to its appeal in this cricket-crazy nation. Ufone continued to take youth as its market niche. Al-Warid launched corporate solutions and packages to attract business and professional users. It announced plans to launch Pakistan's first WiMax network for wireless data services. Telenor aimed to win by offering a high quality of services. Paktel and Instaphone were left to compete on price. Paktel adopted a per-second billing method and offered free Paktel-to-Paktel calls. Instaphone provided the lowest pre-paid SMS and call rates (Mufti, 2006).

By the end of this period, 50% of the market remained under the control of Mobilink. Ufone retained the second spot with 21% of the market share. The impressive performance from new entrants Al-Warid and Telenor made them quickly capture 14% and 11% of market share, while Paktel and Instaphone had 3% and 1% market share, respectively. In the summer of 2007, the world's largest mobile operator China Mobile Ltd acquired Paktel in a US$460 million deal and rebranded it as "Zong". It planned to invest a further US$400 million in improving services and enhancing the network capacity to be able to serve 20 million customers. The acquisition led to confidence among foreign investors about government policies and signalled the potential for further growth in the mobile market in Pakistan (PTA, 2008).

In this period, the third component of our framework, the users in Pakistan, saw the real value of mobile services. The demand for mobile services came from the whole country, including the remote rural areas. The low-income group became the majority of the mobile user population in Pakistan. Particularly, the importance of telecommunications to poor and underdeveloped communities was recognised by the public after the devastating earthquake in Pakistan in October 2005. An interviewee told us: "…the need to communicate was felt so badly by the people that the first thing that they did when they received the first instalment of the compensation from the government to restart building their lives… was to buy a mobile phone" (Gulfam, 2006).

During this period, mobile services were accessible in every city and town and most villages. All social classes including the low-income group and all age groups including children and both genders enjoyed the benefits of mobile telecommunications, although some disparities between different groups of users still existed. The benefits of mobile telecommunication started to reach the grass-root levels of Pakistani society and were set to have far-reaching social and economic impacts on the people of all ages, income groups, genders or demographics.

The last component of our framework, standards and services, went through major upgrades during this period in Pakistan. In 2004, Mobilink became the first Pakistan operator to provide 2.5G GPRS services. Subsequently its network was upgraded to 2.75G EDGE (Mobilink, 2006). Users could use Blackberry handsets to access different data services. A Marketing Manager of Mobilink told us its strategy: "At the moment there is a race in the market towards 3G. I believe there is a market for such (data) services and we would like to be the first company to capture this market" (Moeen, 2006). In the same year Ufone also upgraded its network to 2.5G. Both companies started offering services such as MMS (Multimedia Messaging Service), Web-2-SMS, SMS-2-email, SMS-2-TV, power tools such as ringtones, logos, picture messaging, mobile greeting cards, international roaming, G-mail, E-mail notification, fax, voice mail, call waiting, call forwarding, song dedication services, IVR (Interactive Voice Response) chat-lines, mobile banking, etc (Ufone, 2006).

By the end of 2005, the four major GSM operators in Pakistan – Mobilink, Ufone, Telenor and Al-Warid – had already started offering their customers Internet access using Wireless Application Protocol (WAP) technology. Meanwhile intensive competition in the mobile handset market reduced the price of an average handset to Rs. 6,000 (US$75) while a second-hand phone could be purchased at an average price of Rs. 2000 (US$25), compared with the previous price which was as high as Rs. 40,000 (US$500) (Gulfam, 2006; PTA, 2008). To cater to the potential market demand, the operators started to prepare for launching 3G technologies. In September 2006, Ufone signed a contract with the Chinese company Huawei Ltd for the provision of equipment to enable its network to evolve into 3G smoothly. Meanwhile, Telenor allied with Nokia and Siemens to upgrade its network from 2G GSM to 2.75G EDGE in most parts of the populated Punjab and Federal Capital territory (SPG, 2006; Telenor, 2006; Nasir, 2006). Al-Warid worked with Ericsson to expand and upgrade its GSM network (Technology News, 2006).

C. Discussion and Conclusion

In this paper, we offer a framework which we argue provides a simple but holistic view of the telecommunications market. We discuss both the technological and social factors that influence market development in a country. By studying the case of Pakistan, we provide a rare insight into mobile market transformation in a developing country. In the literature, the very small amount of research on developing countries has limitations, such as being outdated, relying on secondary data and providing only a partial view of the industry (Table 1). In particular, analysis on Pakistan's mobile telecommunications industry is almost non-existent. This paper contributes to the literature on mobile telecommunications market transformation in developing

countries by providing a holistic view, a first-hand account, and a more up-to-date analysis using the case of Pakistan. In this section, drawing upon our framework we will summarise the case study, and raise some important issues by comparing the Pakistani case with the experiences of some other developing countries.

C1. The Experience of Pakistan

The case of Pakistan demonstrates that the mobile telecommunications market is a complex socio-technical system. As proposed by our framework, three groups of social actors together promoted the adoption of innovative technologies and the appearance of novel services in the market. Consequently the Pakistani mobile telecommunications market has transformed forward in three stages, as summarised in Table 3.

We first look at the institutions. In the early phase, the Pakistani government lacked a clear national policy and an efficient regulatory mechanism to govern its mobile telecommunications market. It shifted positions conveniently whenever there was a change in the political setup. In part due to nepotism, the policy formulation adopted a closed process. The changes in the licensing decisions resulted in conflict among the market players when Paktel and Instaphone resisted Mobilink's entry into the market (Looney, 1998). The ban on mobile services in Karachi proved to be a huge setback for the nascent mobile telecommunications industry. What was even worse was that the bureaucratic decision-making system took months to lift the ban (Moeen, 2006). In a sharp contrast, during the last phase, the entry into the market by Warid and Telenor went smoothly due to the support of the national mobile telecommunications policy stipulated by the PTA through an open and consultative process.

The Pakistani experience demonstrates that a strong and credible regulatory regime was the key to the efficient operation of the mobile market based on fair competition. Since the establishment of an independent regulator - PTA - in 1996, which was empowered to take most decisions regarding the industry, policy making became effective and transparent leaving fewer opportunities for political interference (Haroon, 2005). Many steps were taken to protect consumer interests in Pakistan. For example, PTA required the provision of telecommunications services to the deprived rural areas. It also helped establish the CPP regime, and recognised Mobilink as having SMP, hence with additional responsibilities to avoid anti-competitor behaviours. These policies proved critical in transforming the mobile telecommunications market in Pakistan (Mufti, 2006). Furthermore, in the early stages of Pakistan's mobile telecommunications industry, heavy taxes were levied on mobile services. The hefty one-off activation tax charged by the government on all new connections became one of the major obstacles in service adoption (Moeen, 2006). As the analysis shows, adoption increased as this charge was gradually reduced and finally removed (PTA, 2008).

Next we look at two other components of our framework, the operators and users. We conclude that, to win competition and achieve growth, mobile operators needed to expand network coverage, continuously upgrade infrastructure, and provide proper services to specific niche market segments. We found that the incumbents Paktel and

	Start of the Journey (1990 – 1995)	Establishing the Base (1996 – 2003)	Exponential Growth (2004 – 2007)
Institutions	• Lack of consistent policy • MoC in charge of mobile telecommunications industry • Licenses granted to Paktel, Instaphone, Mobilink • Mobile services in Karachi banned • Allegation of nepotism and corruption in awarding licences • Political changes led to conflicting national policies • Heavy taxes levied on mobile services	• Telecommunications Act 1996 passed • Formation of PTA, FAB • MoC merged into MoST and then transferred to newly established MoITT • PTA placed directly under Cabinet Division • Policy-making process more transparent. A consultative mechanism started to appear • Network connection mandated • CPP system enforced • Ufone got a licence • PTA reduced activation fee	• A pro-competition and consumer-focused Cellular Mobile Policy announced • Award of licenses to Telenor and Warid • Activation tax removed • Increased professionalism in mobile industry administration • Consultative and transparent system in public policy making
Providers	• Paktel and Instaphone were incumbent mobile operators • Paktel and Instaphone tried to keep Mobilink out of mobile market • Court ruling enabled Mobilink to launch services in 1994 • Only post-paid services available	• Increased competition as Ufone deployed its GSM network • Operators launched massive media campaigns • Ufone and Mobilink focused on youth • Pre-paid services appeared	• Warid and Telenor entered market with GSM systems • Intense competition • Connection charges removed by operators • Bundled SMS and air time offers • Most competitors used per-second billing
Users	• Low mobile penetration limited to male, high-income users • Mobile service usage limited to major cities of Karachi, Lahore, Islamabad • Mobile phones used as fashion accessory and termed 'toy of the rich'	• Increased penetration due to the adoption by youth • Availability of pre-paid cards and CPP were key drivers for market growth • Increased adoption by students, and middle/ working class	• Exponential growth. Mobile services diffused to low- and middle-income groups in wider area and to different age groups • Number of subscribers increased from 5 million in 2003 to 76.8 million in 2007
Standards & Services	• Mobile market started from AMPS network by Instaphone and Paktel • Later GSM based network launched by Mobilink • Based on GSM technology, Mobilink offered SMS and voice service quality better than that of Instaphone and Paktel using AMPS	• CPP was popular • Paktel and Instaphone upgraded their networks to D-AMPS that enabled the provision of SMS • Complete digitisation of mobile networks in Pakistan	• Race to offer 3G services • Upgrade to GPRS, EDGE • Launch of Web-2-SMS, MMS, voice mail, international roaming, IVR-chat line, mobile banking and other VAS • Provision of internet access via WAP • Massive reduction in handset prices

Table 3. Key events of mobile telecommunications market transformation in Pakistan

Instaphone failed to respond to rapid changes in the market with increasing competition and shifting market needs. Once dominant players in the market, they now have the lowest market share. The newcomers grew by focusing on the market segments that were traditionally neglected by the incumbents. For example, Ufone and Mobilink deployed a strategy of exploring the youth market and promoting the adoption of electronic media (Moeen, 2006). As a result, mobile services diffused rapidly from high-income groups to low-income communities, especially among young people.

With regards to services and standards, the evidence from Pakistan shows the dominance of simple and effective services such as voice communications and SMS in the market. In fact SMS became so popular that it almost knocked Paktel and Instaphone out of the competition when first launched by Mobilink. In contrast, VAS like mobile Internet have not yet fully taken off in Pakistan at the time of writing. In the first phase of mobile development in Pakistan, both AMPS and GSM systems were used. However, GSM was superior to AMPS in offering high-quality voice communications and providing SMS services and hence finally dominated the market. Thus new entrants started with the GSM system and Paktel converted from AMPS to GSM. In Pakistan, market development was further enhanced with locally available franchised sales and customer support centres throughout the country. The billing mechanisms evolved over time. The traditional post-paid payment system was flawed as it had problems in revenue collection and required the customers to pay a security deposit. The introduction of CPP and a pre-paid payment system by Mobilink triggered a significant increase in mobile subscriptions (Moeen, 2006). The removal of connection charges and the availability of cheap handsets were an important step towards widespread adoption of mobile services.

In the last stage of market transformation, due to the support of an efficient, clearly specified mobile telecommunications policy, removing connection charges and reducing taxes and prices, using per-second billing, and providing VAS through network upgrades, the number of subscribers rocketed from 5 million in 2003 to 76.8 million in December 2007 (Figure 1). Beyond this point, the Pakistani mobile industry was expected to experience further growth. New usage will be created through network expansion reaching out to more customers. In the nearly saturated urban markets, price wars are likely to be waged with operators struggling to retain customers and snatching new ones from competitors (Moeen, 2006). The main concern for the industry however is the declining average revenue per user (ARPU), with voice communications as the main revenue source. The operators have to generate additional revenue through data services. Therefore we will see a race in which most operators invest heavily in 3G so as to achieve technological superiority. At the moment the network operators in Pakistan are also the service providers, and as the market gets mature, mobile virtual network operators (MVNOs) are expected to emerge which means fiercer market competition is going to appear (Mufti, 2006).

C2. A Comparison of Pakistan and Other Developing Countries

To draw practical implications for a country to promote the development of its mobile sector, we compare the Pakistani case with the experience of other developing countries (Table 4). Given the issues with past literature raised in Table 1, this will be created from a cross-source analysis using the new framework presented earlier. Some important issues will be raised.

Country	Institutions	Providers	Users	Standards & Services
Sri Lanka	A regulatory system was formed in 1991, two years after the first mobile operation license was granted to CallTel. National Telecommunications Policy was issued in 1994. Sri Lanka failed to implement a unified licensing regime and introduce CPP. Further spectrum auctions impeded growth (Jayasuriya and Knight-John, 2002; Knight-John, 2007).	There are six mobile operators. Mobitel, a subsidiary of the fixed line incumbent, lowered prices aggressively after new providers entered into the market. Competition is the main driver of market growth (Jayasuriya and Knight-John, 2002).	Massive growth was recorded in low-income groups (TRC, 2008).	GSM system is used by all operators (TRC, 2008).
Thailand	Strained relations between the regulator and foreign investors due to capped foreign equity share of 49%. Mobile operators got licences with a condition of sharing revenue with the state-owned operator and transferring ownership after networks were established in return for having the right to use the networks for 25-30 years. This has undermined competition and discouraged further foreign investment (Soonthonsiripong, 2004).	There are one state owned operator and five foreign investors. The entry of new competitors into the market fuelled growth. Pre-paid payment system promoted the growth of customer base, especially in the low-income segment (Nikomborirak, 2007).	Thai users are highly price sensitive which has made pre-paid service gain popularity in this country (Kini and Thanarithiporn, 2004).	Multiple standards are used in Thailand. Three operators have solely GSM network, two operators run both AMPS and GSM, while the sixth operator adopted CDMA system (Nikomborirak, 2007).
India	India liberalised mobile telecommunications market cautiously. It promoted joint ventures and restricted the share of foreign investors in any local telecommunications company (Sinha, 1996; Yahya, 2004).	Indian mobile market consists of twelve service providers: three state-owned, two private, and seven foreign-invested (Chakravarty, 2005).	The rural areas (so-called "C" areas) recorded a growth rate double that experienced in 'metro' areas (Yahya, 2004).	Four operators use CDMA while others use GSM technology (Chakravarty, 2005).

Mexico	State-owned telecommunications industry privatised in 1990. Regulatory policy formulated in mid-90s gave some concessions to private investors in mobile sector that introduced limited competition (Noll, 2001).	Mexico has four operators, with the incumbent Telcel in a dominating position.	Substantial growth due to adoption in low-income areas where fixed lines are unavailable (Mariscal and Rivera, 2006).	Three operators use GSM network (with upgrades to EDGE in some areas) while the fourth one adopted CDMA.
Philippines	Telecommunications industry liberalised in early-90s and National Telecommunications Commission became regulator. Private investment encouraged in mid-1990s, and mandated responsibility for network interconnection (Reyes and Serafica, 2004).	Eight service providers including two MVNOs. Intense competition among the service providers led to a sharp reduction in mobile tariffs (Carlos-Salazar, 2007).	The use of mobile services was limited to high-income groups until the introduction of pre-paid payment system in 1999 which spurred exceptional market growth (Reyes and Serafica, 2004).	Multiple standards in use, including GSM (dominant), UMTS and AMPS. SMS income accounts for more than half of revenue (Carlos-Salazar, 2007).
Bangladesh	A clear and uniform policy is missing due to political interference. A private operator was introduced into the market in 1989, but an independent regulator was formed only in 2002.	Six service providers, one with major foreign stake. Enormous growth witnessed since entry of new players into the market in 2004 (BTRC, 2008).	Under the Grameen Bank scheme, mobile network played a key role in establishing micro enterprises in rural areas (Anonymous, 2002).	Five operators use GSM (with upgrades to EDGE). One operator runs a CDMA network (BTRC, 2008).
Indonesia	Liberalisation started in 1989. Initially private investment had to be based on a revenue sharing agreement with the incumbent operator. Later joint ventures allowed, but local investor must take at least a 5% stake (Bhinekawati and Sugondo, 2004).	Ten operators, among them two are owned by the state. Most operators have significant foreign stake. Intense competition fuelled market growth (BRTI, 2008).	The population is dispersed over 17,000 islands and telecommunications industry is seen as of strategic importance to bring the people together (Bhinekawati and Sugondo, 2004).	Five operators have CDMA network, four firms operate GSM networks, and one operator utilises both standards (BRTI, 2008).
Malaysia	Privatisation and liberalisation started in early 1980s. The government held a consistent policy of promoting competition, but an independent regulatory regime was established only in 1998 (Lee, 2004).	In 1987 Celcom became the first mobile operator. Now eight service providers, including four MVNOs, compete intensely in the market.	Market growth is driven by the youth, especially for data services (Wong and Hiew, 2005).	Operators race to gain technological superiority. Most operators upgrade their networks from GSM to HSDPA (Wong and Hiew, 2005).

Table 4. Mobile telecommunications transformation in some developing countries

In the literature on public policy, liberal economic policies are considered as primary driving forces behind market growth (Koedijk et al, 1996; Megginson and Netter, 2001). Particularly in the telecommunications industry, the policy of supporting market competition has proved instrumental in attracting foreign investment to construct a world-class infrastructure. Such a policy motivates the operators to reduce prices, increase service quality, provide more services to customers, and expand network coverage to reach out to new customers. In practice, many developing countries such as Malaysia (Lee, 2004), Indonesia (Bhinekawati and Sugondo, 2004) and Thailand (Nikomborirak, 2007) present evidence of a strong relationship between increased competition and high market growth. In Sri Lanka (Jayasuriya and Knight-John, 2002) and the Philippines (Carlos-Salazar, 2007), increased competition has led to sharp price reduction. Curwen and Whalley (2008) and Mureithi (2003) report such findings in their studies of telecommunications policy in Latin America and Africa respectively. Adding to this line of literature, the case of the Pakistani mobile telecommunications industry highlights the fact that governmental policy should be consistent and clear in promoting market competition. Ambiguity or constant changes in the policy deter investors' confidence and stall network expansion. This was evident in the early years of the Pakistani mobile industry when the government lacked a clear policy and also modified stances whenever there was a change in the political setup.

Further, the case analysis of Pakistan shows that not only the policies, but also the process of their formulation influences market growth. A wider consensus between market players and the regulator must be obtained on policy issues. Thus, the policy formulation process needs to be transparent, and all stakeholders must be consulted and their suggestions taken on board when strategic decisions are being made so as to avoid conflicts. As in the case of Pakistan, there are lessons from other developing countries. For example in Thailand, the relations between the regulator and foreign investors remain strained due to a capped foreign equity share of 49%, which is said to impede market growth (Soonthonsiripong, 2004).

The study confirms that the establishment of an independent and impartial regulator is crucial to providing a level playing field to all competitors and resolving conflicts (Stern, 1997). In Pakistan in the early 1990s, the absence of a strong and credible regulatory regime facilitated the rift between different market players. Further, a proper sequencing of reforms is important for the smooth transition to a competitive market. The Pakistani case strongly suggests that an independent regulatory regime should be established before the mobile telecommunications sector is opened to private investors. Similarly, the experience in many other countries shows that it is important to establish institutions that promote competition before privatisation. Countries which have done this like Canada, Singapore and Sri Lanka tend to achieve higher investment in telecommunications than those not doing so, including Bahrain, Estonia and Mexico (Wallsten, 2002). Furthermore, the case of the Pakistani mobile industry supports Levy and Spiller (1994) who argue that credible regulatory institutions can be established in an unfavourable environment as long as arbitrary administrative actions can be restrained. Ironically in Pakistan, questions were raised on the impartiality of the regulatory bodies during the early 1990s under the democratic political set-up, while the regulatory regime earned much credibility under the military dictatorship in the first half of the 2000s. It was during this seemingly "unpropitious" environment that the mobile sector saw the least interference.

The formation of the independent PTA reduced the bureaucratic bottlenecks and avoided unnecessary government interventions that would negatively affect the mobile industry, as the case of the ban on mobile services in Karachi showed. Red tape was reduced by empowering PTA to take most decisions regarding the mobile telecommunications market (Moeen, 2006). PTA could take many steps to protect consumer interests in Pakistan. Like regulators in other developing countries such as India (McDowell and Lee, 2003), PTA made it a law that mobile operators should offer mobile services to the deprived communities and expand their networks to the rural areas. It also established the CPP regime, and recognised Mobilink as having SMP with additional responsibilities to ensure the avoidance of anti-competitive behaviour.

For technological and economic reasons, fixed line telephony has been unable to penetrate into most parts of Pakistan (Figure 1). Essentially, mobile telecommunications systems complement the fixed line networks (Garbacz and Thompson, 2007). Mobile technology is seen as a solution for developing countries to catch up in telephony penetration rates, as we can witness in transitional economies in Europe (Vagliasindi et al., 2006) and many African countries (Hamilton, 2003). The instant availability of connection offered by mobile service providers gave them considerable superiority in quality of service over fixed line competitors. This was further enhanced with innovations such as roaming facilities. In Pakistan, the introduction of the CPP regime and pre-paid system triggered a big increase in mobile subscriptions (Moeen, 2006). In fact, the pre-paid billing system has also been popular in other developing countries like India, Philippines and Thailand, and contributed to the fast growth in these markets (Table 4). Moreover, in Pakistan, the majority of mobile users are highly price sensitive. A high subscription fee charged by the operators used to be a major barrier to service adoption. Its removal proved an important step towards the widespread adoption of mobile services. This case study therefore recommends that the mobile operators provide innovative services and adopt a flexible payment system so as to promote service adoption by customers from different corners of society.

The case proves the success of simple and useful services in a developing country. Moreover, the growth in the market was mainly achieved through domestic rather than business and commercial use of mobile services, and by middle- to low-income user groups including the vast market in the rural areas. Specifically, the adoption of mobile services by young consumers contributed heavily to the development of the Pakistani mobile industry. Despite having a low ARPU, these market segments provide a significant portion of revenue for an operator. As observed by Warnholz (2008), from Bangladesh and Haiti, even the poorest can be a thriving market. Particularly in India, mobile services demand in rural areas has more than doubled compared to urban centres (Yahya, 2004). There is thus a need for service providers to develop various kinds of services and attract a diverse range of customers.

Some of the literature from developing countries covers the socio-economic impacts of mobile technology on society. For example, in Bangladesh microenterprises were operated using mobile technologies (Anonymous, 2002), and in Indonesia mobile networks helped connect a population dispersed over 17,000 islands (Bhinekawati and Sugondo, 2004). In Pakistan, mobile technologies tended to benefit low-income

communities by offering them a channel of connection to wider society, as some of them experienced during the earthquake in October 2005.

According to Rouvinen (2006), market competition promotes while standard competition hinders the diffusion of mobile telecommunications services. The case shows the benefits of adopting one technological standard in a market. The prices of mobile handsets and accessories were high in Pakistan in the first phase, partly due to the deployment of the competing standards AMPS and GSM. Roaming and interconnection between two kinds of networks remained problematic. In contrast, the launch of more GSM networks by new entrants and the conversion of Paktel from AMPS to GSM let the manufacturers achieve a higher scale of economy and led to price reduction.

C3. Future Research

Normally, in the literature, a distinction is made between the "appreciative theorising" and "formal theorising" methods. Appreciative theorising focuses on empirical work and empirical substance. In following this line, certain variables may be given emphasis while others may be ignored. The theorising is informal in nature and may be expressed verbally with explicit causal arguments. Formal theorising in contrast is "an abstract structure expressed in highly stylised form" (Edquist, 1997: 28). It aims to enable researchers to explore the logical connections proposed in the theory. Formal theorising "almost always proceeds at some intellectual distance from what is known empirically" (ibid.). It therefore is expected to have fewer errors and logical gaps than appreciative theorising.

This research has not attempted to produce or contribute to a formal theory. Our aim is not to establish strong relations between variables, but to propose a conceptual framework and apply it to systematically study the phenomenon (i.e. the development of mobile telecommunications in Pakistan), with the idea that it may be useful in studying similar cases (as shown briefly in Table 4). The reasoning method is thus "empirical" rather than "theoretical". As such, our research may be criticised for not convincingly establishing relations between various dependent and independent variables and even for ignoring some components of a mobile market value chain (Maitland, Bauer and Westerveld, 2002), such as mobile Internet service providers, manufacturers of mobile equipment and developers of mobile standards. Despite these limitations, this study follows the criteria for "appreciative theorising" by presenting a framework to chart the development in the mobile telecommunications industry in the context of (but not limited to) developing countries. This framework and our case study have taken key elements of Pakistan's mobile telecommunications market into account. It is for future work to consider the contribution of wider elements to the development of mobile telecommunications in different countries.

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