

ICT INNOVATION : MOBILE TECHNOLOGY AND ECONOMIC GROWTH

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ABSTRACT

The Information Communication Technology (ICT) is considered the driving force behind the long unprecedented economic growth period of the last decade. It provided the infrastructure for economic development, helped create the knowledge society, contributed to innovation and created value for the economy. ICT is a broadly used term that can encompass many technologies used to produce, process, exchange and manage the information and knowledge. Europeans have massively adopted broadband and internet services. This is changing the economy and transforming lifestyles. But the benefits of these significant changes for the European economy will only be unleashed if several challenges are tackled. First the internet economy must be kept open, notably to innovative business models. With the help of modern information communication technology, mobile banking as a new type of financial services carrier can provide efficient and effective financial services for clients. This paper explores specific ways that ICTs as mobile technology in the form of mobile banking can be used in various business process, deployment of mobile penetration as mobile payments. Further it studies the impact of mobile technology on European economy and its diffusion with Finland case study.

KEYWORDS: MPEG, GSM, ADSL, ICT, M-banking.

INTRODUCTION

Information Communication Technologies (ICTs) are no longer just for internal use. Rather, in the era of open and distributed innovation ICTs must be leveraged by businesses and organizations to reach, record and review ideas from internal and external sources ranging from vendors, suppliers, customers and employees. Interacting with all stakeholders improves the quality and consistency of ideas. ICTs enable this process at all levels through inclusion and interaction. In particular, ICTs enable management of sources of ideas, documentation of idea histories, distribution and sharing of ideas, market targeting and organic idea development. The emerging trend of distributed and open innovation illustrates that customers and users are no longer passively waiting for products. Widely connected, interactive and collaborative practice of innovation will provide a competitive edge to the corporations that carefully select and deploy ICT strategies. ICT innovation will be one of the most important elements in enabling a sustainable exit to the current economic crisis. ICT have been recognized as a powerful tool to potentially resolve historical divides between developed and developing economies by providing an infrastructure to deploy minimal services (health, education, business and government, for example) to rural communities and under-privileged populations. The high growth rate of mobile handset diffusion in the 1990s is one of the tremendous success stories of the telecommunications industry. By the end of 2007, almost one out of two people had a mobile phone. In Europe, penetration has surpassed the 100% mark. More than one out of 4 African and one out of 3 Asian have a mobile phone. A high level of competition and a decrease in prices have been able to reduce the digital divide in mobile telephone, substantially.

Currently, a number of mobile payment procedures, which is a typical application of ICTS, have been used widely from developed countries to developing countries. Mobile payment is an exciting domain, which will rapidly evolve in the years to come (Karnouskos S. & Vilmos A., 2004). Despite a widely reported economic slowdown in 2008, the global mobile handset market has been unaffected by the present economic slowdown. If there was one highlight in 2008, it was that the smart-phone segment grew 22.5 percent, according to IDC's Worldwide Mobile Phone Tracker report (IDC, 2009). Mobile payment transaction values for digital and physical goods to exceed \$300bn globally within five years, and forecasts total mobile payments to grow nearly tenfold by 2013, according to Juniper Research (Juniper Research, 2008). Over the past five years, the mobile services industry has experienced dramatic changes. Europe, which led the way during the expansion of mobile telephone telephony in the 1990s, is challenged by Asia where emerging markets like China and India are in the spotlight of the basic mobile voice and messaging business, while South Korea and Japan have paved the way for more advanced mobile services (Vesa J., 2007). There is almost one - or more than one in some European countries (Finland, 114.5%, Statistics Finland, 2008) - mobile phone for every person in much of the developed world. In contrast, only 48.5% of Chinese population (641.2 million users) used mobile phones by the end of 2008 (MIIT, 2009), and the numbers are expected to rise to about 858.7 million in 2010 (IE Market Research-IEMR, 2008).

REVIEW OF LITERATURE

In 2002, the total number of mobile (cellular) phones in use worldwide exceeded the number of landlines. Current projections suggest that the world will continue to add mobile lines faster than fixed lines; indeed, the next billion new phone users will use primarily mobiles (ITU 2007; Lanvin 2005). Both the developed world and the developing world are participating in this boom, but in different ways.

M-banking/m-payments systems have all the markers of an “innovation” waiting to be “diffused” to or adopted by a subset of mobile users in the developing world (e.g., Rogers, 1983). Brown, Cajee, Davies, and Stroebel (2003) used a statistical model combining elements of the theories of diffusion of innovation (Rogers, 1983) and of planned behavior (Taylor & Todd, 1995) to predict mobile banking take-up in South Africa, finding high levels of perceived risk to be a major barrier to further adoption.

The best impact assessment to date is (Porteous, 2007), in which impact is operationalized using an “access frontier,” which divides those who have the wherewithal—a monthly income from a formal source—to open the most basic of conventional bank accounts. Those below the frontier who use m-banking/m-payments systems do so as an alternative or addition to other choices. Those from above the frontier have done so by necessity. Before new mobile payment services are launched, it is important to understand what previous studies have discovered about the acceptance of mobile payment services and about mobile services markets, and also what issues have remained unanswered. In line with Zmijewska and Lawrence (2005). Mobile payments are payments for goods, services, and bills/invoices with a mobile device (such as a mobile phone, smart-phone, or Personal Digital Assistant) by taking advantage of wireless and other communication technologies (such as mobile telecommunications networks, or proximity technologies). Mobile devices can be used in a variety of payment scenarios such as payment for digital content (e.g. ring tones, logos, news, music, or games), concert or flight tickets, parking fees, and bus, tram, train and taxi fares, or to access and use electronic payment services to pay bills and invoices. Payments for physical goods are also possible, both at vending and ticketing machines, and at manned Point-of-Sale terminals. Typical usage entails the user electing to make a mobile payment, being connected to a server via the mobile device to perform authentication and authorization, and subsequently being presented with confirmation of the completed transaction

ICT INNOVATION AS MOBILE BANKING

As economic concerns prompt consumers to manage their finances more closely, their desire for real-time access to- and control of- their aggregated financial information is increasing the urgency for banks to create a mobile banking channel. Mobile banking provides yet another channel for banking services, and in emerging markets provides some possibility for becoming a primary channel. Mobile phone use is high across all demographic and socioeconomic groups, unlike desktop Internet use. It implies that mobile banking technology can draw in new “unbanked” customers. Over the years, banking has transcended from a traditional brick-and mortar model of customers queuing for services in the banks to modern day banking where

banks can be reached at any point for their services. In today's business, technology has been on the predominant indicators of growth and competitiveness. The banking industry today is in the industry of it revolution. The combinations of regulatory and competitive reasons have lead to increasing importance of total banking automation in the banking industry. Information technology has basically been used under two different avenues in banking. One is communication and connectivity and other is business process. The latest revolution seems to happen with respect to mobile banking an attempt to leverage on the synergies of mobile banking technology in telecomm and information technology in the banking services, (http://en.wikipedia.org/wiki/mobile_banking) Mobile Banking is increasingly being employed by many banks around the world to generate additional revenues, reduce costs or to increase customer satisfaction, often with very promising results. For instance, the utilization of transaction-based MFS of Finland-based Nordeabank grew by 30% in 2004 (Atkins, W.,2005). The number of France's Société Générale customers using mobile services crossed the mark of one million in year 2004, registering an impressive growth of nearly 200% vis-à-vis 2003 (Societe Generale , 2004). These facts point toward a positive shift in the customer perception of Mobile Banking. On the other hand, technological developments like Universal Mobile Telecommunications System (UMTS) have provided a new platform for realistic mobile applications. Unlike in the past, when banks offering mobile services suffered a severe setback due to lack of customer interest and unripe technologies, the time seems to be now ripe for (re-)launching mobile services. Mobile Banking is usually defined as carrying out banking business with the help of mobile devices such as mobile phones or PDAs (Georgi, F 2005, Lube, A, 2004).

Mobile banking is the hottest area of development in the banking sector and is expected to replace the credit/debit card system in future. In past two years, a mobile banking user has increased three times if it is compared with the use of either debit card or credit card. Moreover 85-90% mobile users do not own credit cards(Stuart J.Barnes ,Brian Corbitt 2003). There is at least 36% of population that are literate have mobile phones and have no access to credit. This is the potential market that would appreciate mobile banking solutions. Mobile phone banking technology is giving the un-banked, the under-banked and the poor in general, easier access to credit, thus contributing to poverty reduction and improved economic growth. Based on data accumulated by global institutions, mobile money deployments are increasingly becoming popular for the un-banked and a potential instrument for poverty reduction. By 2012, 364 million low-income, un-banked people could use mobile financial services. Likewise, the number of people without a bank account but with a mobile phone is estimated to grow from one to 1.7 billion(Juniper Research, 2009) .

IMPACT MOBILE DIFFUSION IN EUROPEAN ECONOMY

Europe remains a global force in advanced information and communication technologies (ICT). The World Wide Web, the mobile GSM standard, the MPEG standard for digital content and ADSL technology were all invented in Europe. Maintaining this leadership position and turning it into a competitive advantage is an important policy goal. The mobile sector's size demonstrates its importance to the European economy. The sector represents 1.3% of EU Gross Value Added, 1.2% of EU GDP, and employs over 600,000 people. Within EU telecoms, mobile

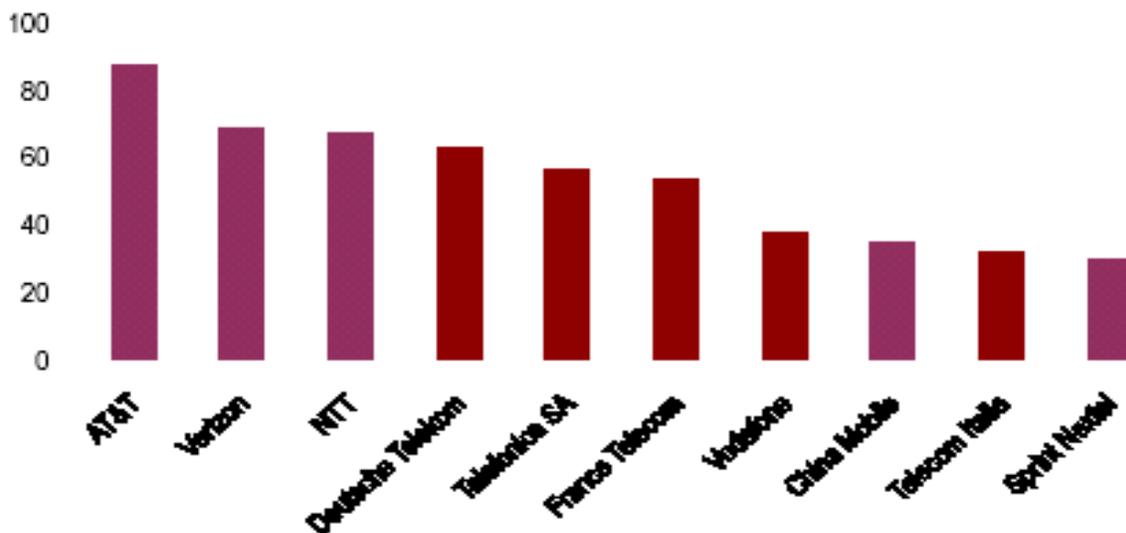
revenues now account for around 61%, up from 47% in 20025. The sector continues to invest in its next generation infrastructure – a strong economic stimulus.

Europe is also home to the leading players across mobile services and equipment, with exports worth more than three times the exports of Korea or the US8. Further, Europe is a mobile business model innovator – in network outsourcing and network sharing – creating significant efficiency in the sector. And Europe is a product innovator – Nokia, Alcatel and Ericsson are 3rd, 5th and 9th respectively worldwide for telecoms patent innovation. Through continued innovation, Europe can retain this leadership – and export its expertise as part of the knowledge economy.

INDUSTRY LEADERSHIP OF EUROPE’S MOBILE COMPANIES

Europe’s mobile companies are global industry leaders. Europe is home to five of the top ten global telecommunications services firms by revenue – Deutsche Telekom, Telefonica SA, France Telecom, Vodafone and Telecom Italia²³ (see figure 1).

**FIGURE 1 ; TOP 10 TELECOMMUNICATIONS SERVICES FIRMS BY REVENUE
2009 (€ MILLIONS)**

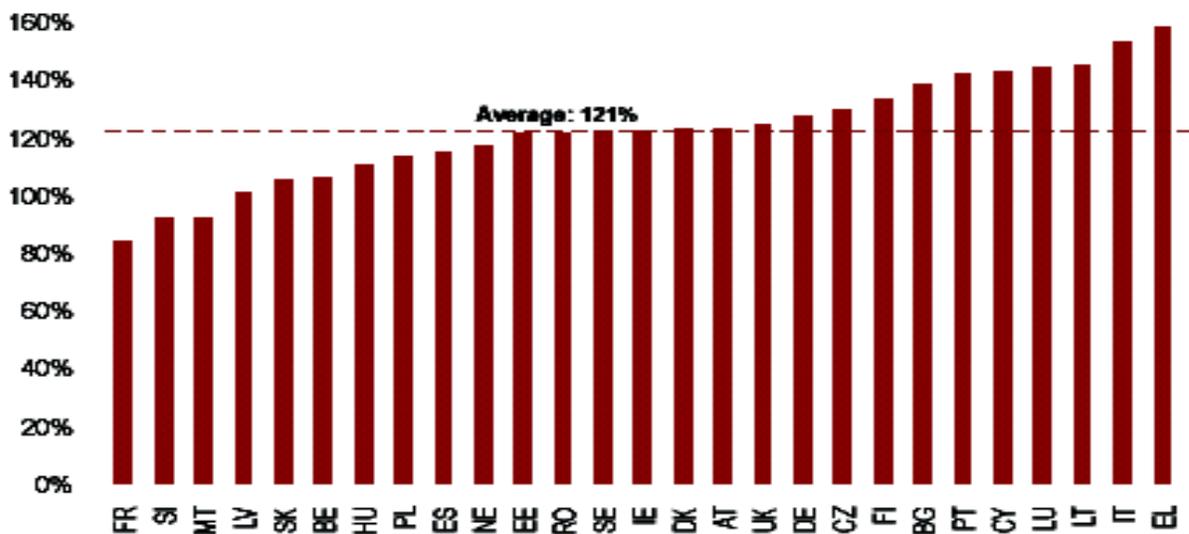


Source: Information Technology Outlook 2008, OECD

In terms of equipment manufacturing, European firms Nokia, Ericsson and Alcatel-Lucent represent the 1st, 4th and 5th largest communications equipment and systems firms in the world. Nokia had 38.6% of the handset market in 2008. Taking the EU in aggregate, European exports of telecoms equipment are worth more than three times the exports of Korea or the US (at €69bn for 21 of the EU countries vs. €22bn for Korea and €19bn for the US). Many European governments have explicitly decided to specialize in mobile, recognizing the positive benefits that accrue. Finland and Hungary for example have provided public investment, and promoted private investment, within the mobile industry. According to the Lafay Index (which measures a

country's comparative advantage in particular sectors – in this case telecommunications) Finland, Hungary and Sweden are 1st, 3rd and 4th amongst the OECD countries. Finland's telecoms equipment exports account for 13.9% of its total exports – the highest level in the OECD. Public policies and liberalization played an important role in the early stages of the mobile industry's development there. Finland has maintained high levels of public and private investment in R&D in the sector, allowing industry giants such as Nokia to rise to the fore. Mobile is the most highly penetrated communications platform across the EU. Penetration now exceeds 121% (see Figure 2) and 83% of EU households have access to at least one mobile; only 49% have PC-based broadband access. Indeed the Gini Coefficient (a measure of inequality of access) was twice as high for PCs as for mobiles in 2007.

**FIGURE 3: TOP 10 TELECOMMUNICATIONS SERVICES FIRMS BY REVENUE
2009 (€ MILLIONS)**



Source: *Wireless Intelligence* 03 Aug 2009

The number of EU households relying solely on mobile, with no fixed line at all, rose from 18% in 2005 to 24% in 2007. This is occurring not just in countries where mobile is leapfrogging fixed line services but also in mature markets where consumers are simply deciding that mobile alone is the preferred platform for meeting their communications needs.

FINLAND CASE STUDY

The adoption of the mobile phone by larger user groups has been particularly fast. In Finland, the expansion of mobile phone use to larger, especially younger, user groups began in 1997 as new, inexpensive mobile terminals entered the market and mobile operators introduced more competitive prices for their services. The number of SMS messages sent during the first two months of 1998 was sevenfold greater than the preceding year. The same period saw the number of existing GSM subscriptions double. The seniors age group, (people over 60) adopted mobile phones a couple of years later than the other age groups. According to Statistics Finland

(Statistics Finland statistics 2007), almost 80% of Finns aged 55 to 74 owned a mobile phone in November 2003. In 2005, the mobile phone had practically penetrated almost all age segments. For instance, the penetration of mobile phones is now higher than the penetration of TVs. The mobile phone is also more common than the car, the computer or the video recorder. In 2005, 43 % of Finnish households owned at least one multimedia phone (Statistics Finland 2007). In 2007, the number of outgoing calls from mobile phones and the number of text and multimedia messages has continued to grow. The volume of data transmissions, which have been affected by the introduction of mobile broadband connections, has also increased. (Statistics Finland 2008)

TABLE 1. NUMBERS OF OUTGOING SHORT MESSAGES AND MULTIMEDIA MESSAGES FROM MOBILE PHONES IN 2002–2008

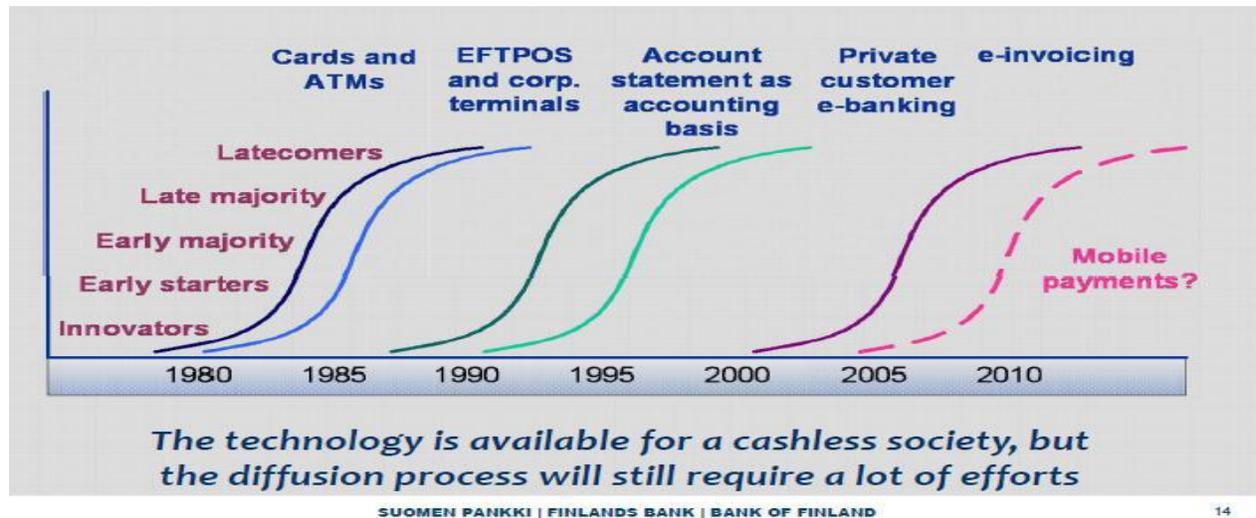
Year	Short message thousands	Change %	Short message/ Subscription	Multimedia message thousands	Change %
2002	1 324 668		293		
2003	1 647 218	24,3	347	2 314	
2004	2 193 498	33, 2	439	7 386	219, 2
2005	2 728 230	24, 4	507	15 993	116, 5
2006	3 087 998	13, 2	544	21 568	34, 9
2007	3 182 362	3, 1	524	28 682	33, 0
2008	3 566 523	12,1	517	37 801	31, 8

Source: Telecommunications 2008, Statistics Finland.

MOBILE PAYMENT CASES OF THE FINNISH MARKET

Finnish cashless payments, especially a variety of card payments, are considered main payments and are growing very fast this decade. According to the Federation of Finnish Financial Services (FFFS), the number of payment card transactions is up to 986 million, and the total value of card payments per card is 11,216€ in 2007. Likewise, 4.28 million customers make transactions via Internet bank payments (FFFS, 2008). At the same time, the high rates of mobile phone subscriptions (114.5% in 2007) and the number of subscriptions per 100 populations in the recent decade in Finland is a success step of mobile payment and mobile commerce, with high rates for card-based payments (Telecommunications 2007). Some mobile-based banking services – e.g., credit transfers and balance inquiries – have been available in Finland since 1996. At first, mobile banking services were based on SMS text messages, and then on Wireless Application Protocol (WAP) phone banking applications. WAP phone-based solutions were launched in 1999, and now most Internet banking services offered by banks are also available via WAP.

Even before GSM and WAP-based services, there was telebanking in Finland. People can still phone in to call centers and handle their banking affairs that way (Jyrkonen H & Paunonen H. 2003). Based on Finnish experiences, payment developments are relatively slow and follow an s-shaped diffusion curve (Figure 3). There is a long way to go in order to bring mobile payments from the application level to a high services level, considering the low penetration of mobile payment customers in Finland.



Payment developments and diffusion in Finland Source: Bank of Finland, 2008

Payment services have traditionally been provided by banks in Finland. During recent years non-banks, such as telecom operators, have started to provide payment services, and so competition has increased. Since 1997, a Finnish phone operator, Sonera, has provided a service for paying a soda from vending machine using a GSM phone. Nowadays, ringtones, logos, Java games and True Tones for mobile phones through mobile payment are common services in Finland. Furthermore, city transportation tickets are offered using SMS, such as Helsinki City Transportation, which is charged on one's phone bill and needs no registration.

□ Case 1: Helsinki City Transport (<http://www.hel.fi/>)

Text messages are a part of everyday life in Helsinki and the Helsinki City Transport Ticket service, which can be bought with mobile handsets, is another Finnish breakthrough in mobile services and m-commerce. Apparently, this scheme was very successful, as mobile ticket users are satisfied and the number of free riders has been reduced (Mallat, N., et al. [12]). All major mobile network operators in Finland, including Sonera, Radiolinja and Telia, opened their network access for SMS-ticketing services. The ticket was specially priced (the client will get the ticket in the form of a reply message to his phone at a charge of €2) and is valid for a full day of travel on the city's green trams and metro service.

□ Case 2: Sonera Shopper (<http://www.sonera.fi/>)

Sonera Shopper service, used since 2002, is provided by mobile operator Sonera, and has also been active in the payment area. In this system the customer opens a Shopper account and transfers money to it from his or her bank account. Thereafter, one can pay for purchases at merchants that have joined the system by sending a text message. The customer can also pay for purchases out of a credit card account (Visa, Eurocard and MasterCard) instead of his or her Shopper account when the customer's credit card number is entered into the Shopper system.

□ Case 3: MediaPlazza (<http://suomi.ringtone-logo-game.com/>)

At the moment, MediaPlazza is a subsidiary of Jet Multimedia, one of the European leaders in interactive multimedia online services. MediaPlazza sells ringtones, logos, Java games and True Tones for mobile entertainment services more than 20 countries in the EU, including Finland, UK, Italy, France, Switzerland, etc. Like other providers, such as MTV Networks (<http://www.mtv.com/>), Jamster (<http://www.jamster.co.uk/>) and Aspiro (<http://buumi.net/>), the small company has committed itself to mobile entertainment in recent years. Also in this solution, the customer can download and pay for these digital entertainment productions by SMS, via online banking or with PayPal.

□ Case 4: EMPS (Electronic Mobile Payment Services)

In September 2001 Nokia launched a dual-chip solution called EMPS (Electronic Mobile Payment Services). One chip was a usual SIM (subscriber identity module) card and the other was a WIM (WAP identity module) card issued by the Finnish bank Nordea for making Visa Electron payments. In this application the phone is equipped with one SWIM chip card that includes both the SIM and WIM functions. In this solution the operator handles customer identification. The credit card number (Visa) is stored inside the phone, and the consumer makes payments by phone and receives a credit card invoice later. It will build on the groundwork established by the Wireless Application Protocol (WAP), Bluetooth and the specification by Europay, MasterCard and Visa for smart cards (EMV).

□ Case 5: International mobilepayment procedures used in Finland

There are many international, especially European, mobile payment procedures used in Finland, such as Paybox, Mobipay, Mobilemoney, Payex, PayPal, Iti Achant and Mobilix. One of the most widespread mobile phone payment applications is Paybox (<http://www.paybox.net/>), which was launched in Germany in May 2000, and later came to be used in Finland, Austria, Spain, Sweden and the UK. This service enables the customer to purchase goods and services and make bank transactions via mobile phone.

CONCLUSION

Technology, knowledge and innovation play a crucial role in explaining the competitive potential of firms and countries in today's globalized world. With lowered barriers to international activities, firms develop technological competencies abroad, either internally, or

through inter-firm collaboration. Contribution of ICT to the overall economic growth and competitiveness of respective economies is of major importance.

Mobile communications drives economic growth in developing countries. The research emphasized the impact of mobile networks on the global economy. From the creation of both direct and indirect jobs to facilitating business, mobile plays a unique role in developing countries, particularly given the lack of other forms of electronic communications. Given the growing impact of mobile communications for economic development, it can be a sector to help countries overcome the impact of the economic crisis in other sectors. It makes economic sense to support and sustain the mobile sector. Mobile theory must keep pace, accounting for m-banking systems along with other capabilities enabled by this increasing flexible technology, offering a way to lower the costs of moving money from place to place and opening a way to bring more users into contact with formal financial systems. M-banking systems may prove to be an important innovation for the developing world. .

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