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MOBILE INTERNET FOR GROWTH: PROJECT REPORT

Prepared by Bain & Company, January 2009



BAIN & COMPANY

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Executive Summary

The Mobile Internet is entering a critical phase. Since its emergence in the late 1990s, relatively low bandwidth and coverage and the limits imposed by handsets have held back the development of truly innovative applications and hampered consumer adoption. Until recently, it seemed that the potential of Mobile Internet services to create value for individuals and societies would take much longer than expected.

But over the last 12 months, several significant developments have contributed to the evolution of Mobile Internet to bring the promise closer. Mobile access has improved dramatically: In April 2008, the number of cellular users worldwide passed the 3 billion mark and reached an estimated 4 billion by year end. Growth in third-generation (3G) penetration is accelerating, reaching nearly 7 percent of the global population by the end of 2008. New smartphones with innovative features such as touch screens and larger displays have been released and are closing the gap between the mobile and wired Internet experiences. The bandwidth and reach of the mobile data network infrastructure has improved. Increasingly, standardized and open software platforms ease the development of mass-market content, resulting in millions of downloads from popular application stores in the last quarter of 2008 alone. Innovative yet low-tech services, such as mobile money transfer or mobile health applications, have been launched and are gaining traction in emerging markets.

Still, the remaining challenges need to be addressed jointly by industry participants, regulators and governments in order to usher the Mobile Internet to its full potential. At this critical point in time, the World Economic Forum initiated the project “Mobile Internet for Growth” to foster dialogue among the key parties on how to address the emerging bottlenecks and collaborate in the future development of the Mobile Internet ecosystem. This report summarizes discussions with industry experts, academics, entrepreneurs and public representatives held between June and December 2008.

Part I: The Mobile Internet Landscape outlines the current state of adoption and anticipated trends in the key global regions. Recent growth rates and penetration indicate that the global Mobile Internet sector is indeed at an inflection point: By 2010, investment in mobile connections will account for nearly one-third of all Internet access spending. Not surprisingly, however, a clear divide persists between industrialized and emerging nations: In the latter, the Mobile Internet is still nascent, with limited availability of 3G networks in many markets. Revenue growth is expected to slow considerably in developed markets, due not only to market saturation, but also to declining prices as competition intensifies. Though the growth potential is dramatic in emerging markets, they too will quickly face price pressures, particularly as operators expand beyond dense urban areas to lower-income rural populations. It is also becoming clear that Mobile Internet adoption will follow a very different path of development and adoption in emerging markets, where access to wired internet connections is much more limited. The primacy of mobile access in these markets may well give rise to new business models and global competitors.

Part II: Opportunities for cross-industry collaboration examines in more detail the value proposition of Mobile Internet services in three areas (mobile banking, mobile health and mobile media and entertainment (M&E)) The development of applications will be key to advancement, and we outline the current state of development, barriers and opportunities for market participants to work together.

Four common themes emerged. First, the technologies that support emerging solutions in all three areas are fragmenting, and the lack of standards and interoperability results in high development costs and long delays in bringing complete solutions to market. This in turn slows broad consumer adoption. Second, uncertain financial returns are creating private-sector investment deadlocks. For example, mobile health services with their preventive character are not aligned with healthcare reimbursement schemes currently in place in most countries. Third, earning consumers' trust is a key to succeeding in all three areas, particularly with regard to the collection and storage of personal data, with implications for branding, privacy, and customization efforts. Finally, in order for

most applications to achieve the desired momentum, it is critical that industry participants find effective way to work in a collaborative fashion.

Part III: The social impact of Mobile Internet examines how recent academic research attempts to measure the social value of Mobile Internet in economic terms and the readiness of societies to embrace Mobile Internet services—vital questions for private and public companies when discussing strategies for the development of Mobile Internet. Today, there is no standard methodology to make meaningful comparisons and spur dialogue on this topic. Existing data on the adoption and impact of value-added services (VAS) are fragmentary and inconsistent. We offer some initial thoughts on how to collect, aggregate and interpret data on Mobile Internet VAS adoption to foster discussion. It is our aim that this dialogue will help the Forum complement its existing Global Internet Technology Report with some additional mobile-specific measures.

Part IV: Potential near-term hurdles include three broad challenges holding back the development of the Mobile Internet: how to ensure continued investments in infrastructure; how to stem the fragmentation of the content development and deployment environment; and how to leverage customer context and data to provide personalized services while ensuring privacy and security.

This last section will serve as a starting point for one of the Industry Partner discussions in the 2009 World Economic Forum Annual Meeting, where representatives of the Telecommunications, IT and Media communities will meet to discuss critical questions in the future evolution of the Mobile Internet:

- **Is there enough network capacity and coverage to handle projected increases in traffic?**
In particular, how quickly will backhaul infrastructure be strained and what can be done to alleviate the bottleneck? How promising are recent experiments with femtocells, WiFi and other technologies to move traffic off net? And how close are we to a viable alternative energy source to help connect people currently “off the grid”?
- **What are the chokepoints that hamper consumer adoption of mobile content?**
How significant a barrier is the continued fragmentation of the development and discovery environment? Will it require industry consolidation to address this issue, or can third party VAS companies play a role in simplifying the process for developers, operators and consumers? Can a viable revenue model emerge in the absence of a scalable advertising solution?
- **How can industry participants take advantage of consumers’ context (location, preferences, recent transactions) to provide personalized services without compromising privacy and security?**
Which companies have the capabilities to do this? Have any built up enough consumer trust to attempt it? What guarantees do consumers want? Is there a role for regulators? How can societies make the best use of the aggregate data generated by the Mobile Internet (traffic patterns, epidemiological data, etc.)?

The 2009 Annual Meeting will bring this phase of the Mobile Internet for Growth project to a close; discussion outcomes will form the basis for 2009 priority topics to be further explored.

The Mobile Internet Landscape

Executive summary

The Mobile Internet¹ is coming of age. Since long it has been regarded as the future growth engine for the wireless industry, promising multi-faceted benefits for the consumer - from flexible access to rich content to by-passing fixed Internet infrastructure investment needs in emerging nations. Indeed, we have observed several developments indicating that consumer adoption is beginning to reach an inflection point: a proliferation of easy-to-use devices with more advanced capabilities like Apple's iPhone; the next generation of network infrastructure; and increasingly open technology platforms that ease the development and deployment of innovative Internet services. Today, \$64 billion of global consumer spending on Internet access is related to Mobile Internet—by 2010, this figure is expected to rise to \$91 billion, or about one third of all Internet access spending.²

Key uncertainties

- Will Mobile Internet solutions be embraced by the mass market?
- Is there a business model blueprint? How will profit pools evolve?
- How can supply and demand bottlenecks be overcome? What is recession's impact on discretionary spending?
- Where and how do market participants need to collaborate across industry borders?

Despite growing consumer demand, many market uncertainties continue to cloud the future of this sector. Exactly how the Mobile Internet will develop is unclear, as well as the business models that will support it. This report offers an overview of the current state of Mobile Internet markets in major regions throughout the world. We have focused on the role that Mobile Internet services are expected to play in propelling wireless industry growth, as well as examining critical industry enablers.

Global growth in wireless service revenues is slowing; emerging markets gain importance

Global wireless service revenues (including voice and data) continue to increase: In 2008, the sector volume totals \$906 billion and is anticipated to break the \$1 trillion threshold by 2010. However, throughout the world, expansion rates vary significantly from region to region.

In industrialized nations—North America, Western Europe and parts of Asia-Pacific—wireless service revenue growth is slowing, with a projected decline from 6 percent annually in 2007-2010³ to just 2 percent in 2010-2013. This slowdown stems largely from two factors: high levels of market saturation with mobile phone penetration topping 100 percent in most countries⁴, and shrinking customer value—in Western Europe, the average revenue per user (ARPU)⁵ has decreased by 4 percent since 2004.⁴ Raising these levels is a critical challenge for providers: Although prices are relatively high in these countries compared to emerging markets, they are dropping steadily as services become more interchangeable and providers use pricing to gain a competitive edge. Since 2004, the average price per minute has fallen by 12 percent annually.⁴

The picture is strikingly different in emerging regions such as the Middle East, Africa, Latin America, India and China. With wireless service revenues increasing between 6 and 12 percent

¹ For the purpose of this discussion, we define Mobile Internet as the access to information stored in the public Internet or in proprietary portals via a cellular device, primarily smartphones but also e.g. including laptops with data cards. Quoted Mobile Internet access revenue figures do neither include any fees paid for content nor fees paid for basic data services such as messaging. In contrast, quoted mobile data service revenue and ARPU figures include fees for basic data services, Mobile Internet access revenues and fees paid to mobile operators for specific content. Industry analysts use different methodologies that result in different estimates and forecasts for these markets.

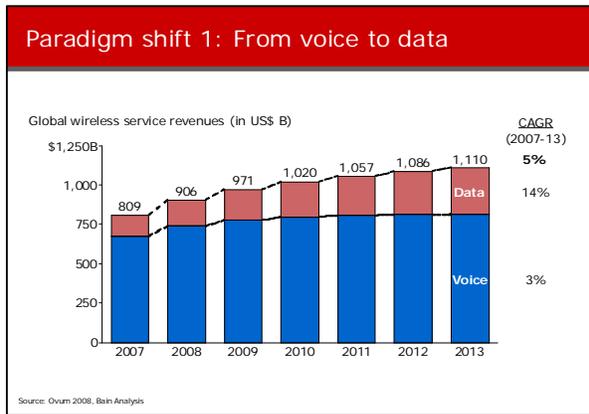
² PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

³ Ovum: Global mobile market outlook 2008-13 (2008); annual growth rates here and subsequently reflect Compound Annual Growth Rates (CAGR)

⁴ Analysys Mason Limited: Telecoms Market Matrix (2008)

⁵ Average revenue per user (ARPU) is calculated throughout this document on a yearly basis

each year, these countries are the main growth engine for the entire wireless sector. With the number of mobile device users lagging behind industrialized nations, emerging markets provide a huge opportunity for expanding the customer base. In China, only 45 percent of the population owned a mobile device in 2008.⁶ But even in these fast-growing regions, average revenue per user is already declining to the fact that lower income users come into the markets—in Latin America, for instance, customer revenue rates are projected to drop from \$216 in 2007 to \$202 in 2013.⁷

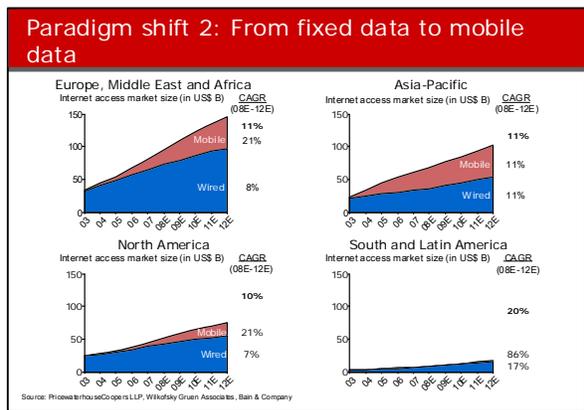


Mobile Internet adoption has reached an inflection point

In every region, mobile data services⁸ are gaining importance as revenue sources: In 2008, data services accounted for 18 percent of all global mobile service revenues. This segment is expected to continue powering growth at a rate of 14 percent each year through 2013. In industrialized nations, revenue from traditional phone services is stagnant: In the United States, this segment will remain flat until 2010, and then turn negative. By contrast, US mobile data service revenues are projected to increase by 25

percent annually. By 2013, the number is anticipated to reach almost \$70 billion—or 35 percent of the total US wireless services market.⁷

In the past, messaging services such as texting have been key to the growth of mobile data services, accounting for about half of all data service revenues in 2008.⁹ But the global messaging market is expected to start flattening out. Meanwhile, customer spending on Mobile Internet access has surged by 63 percent since 2003, primarily because of the exceptional consumer adoption rates in developing nations.¹⁰ But even in Western Europe and North America, consumer spending on Internet access has increased by well over 50 percent each year. Even if the spending rate slows slightly, the global Mobile Internet market is expected to continue its expansion. All regions¹¹ will reach growth rates of over 25 percent annually, passing the \$100 billion value mark by 2011. The Mobile Internet is projected to account for 34 percent of all spending on Internet access by 2012.¹²



⁶ Euromonitor (2008)

⁷ Ovum: Global mobile market outlook 2008-13 (2008)

⁸ Encompassing basic data service such as messaging services and Mobile Internet services

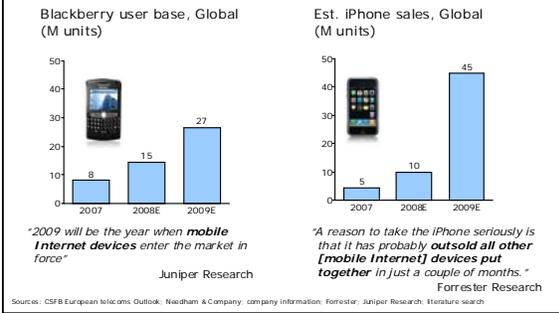
⁹ Ovum: Global mobile market outlook 2008-13 (2008) & Messaging forecasts 2007-2012 (2008)

¹⁰ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

¹¹ Except for Asia/Pacific, where growth is less vivid due to Japan’s already very advanced position

¹² PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

Consumer adoption of mobile broadband devices is accelerating



This growth in Mobile Internet revenues is driven by two factors. First, the number of Mobile Internet users continues to grow, which is reflected in smart phone shipments worldwide: In 2008, shipments of 3G-phones jumped by 39 percent to 314 million units.¹³ As a result, we also see more data connections¹⁴ in industrialized nations (7 percent annual growth in Western Europe, and 11 percent growth in North America from 2007 to 2013).¹⁵

Second, this growing customer base uses the Mobile Internet more intensely. Innovative devices such as Apple's iPhone get much of the credit for

attracting new users: iPhone customers conduct Web searches 50 times more often than other Internet device users,¹⁶ demonstrating the importance of user-friendly interfaces. Average data revenues per user also are on the rise, with 12 percent annual growth in North America.

However, Mobile Internet customer adoption rates and service use varies significantly across regions due to several variables: the degree to which third-generation (3G) and fourth-generation (4G) cellular networks are rolled out; the availability of easy-to-use devices, accessible content and services; competitive pricing and supportive regulations, such as allocating more frequencies or encouraging foreign capital investments. In the following section, we track the most important Mobile Internet trends, region by region.

Key uncertainties

- What are the applications that will drive future demand for Mobile Internet access?
- Will 3G/4G network infrastructure meet growing bandwidth demands?
- Do current regulations sufficiently foster market development? How to protect IP?
- What role will alternative cellular technologies (e.g., WiFi) play?
- How can data privacy concerns of consumer be overcome?

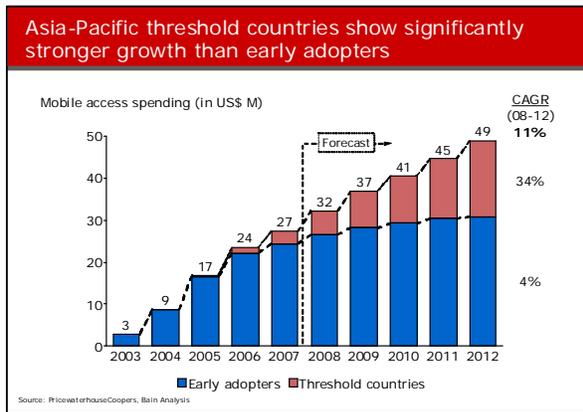
¹³ IDC: Worldwide mobile phone forecast update (2008)

¹⁴ Data connections are – in analogous logic to fixed telephone connections – all users that use data services at least one a year (Ovum 2008)

¹⁵ Ovum: Global mobile market outlook 2008-13 (2008)

¹⁶ Rich Miner, Head of Mobile Platforms, Google

Asia-Pacific: Dominant region, with significant untapped potential



Asia-Pacific is home to the world's largest Mobile Internet market: In 2008, Asia-Pacific users generated 35 percent of mobile data service revenues and 50 percent of all Mobile Internet access revenues. By 2012, the rest of the world will begin to close the gap, but Asia-Pacific will remain the Mobile Internet sector's most important region.

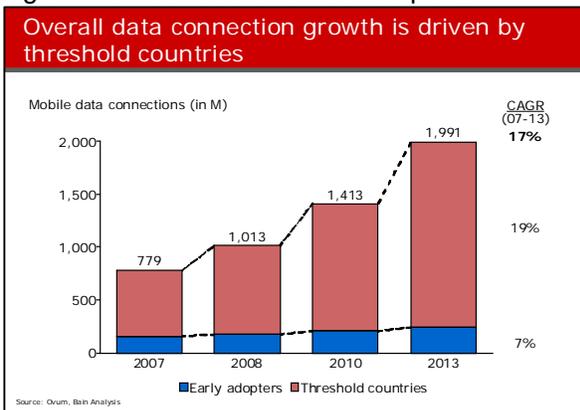
This regional dominance is powered by Japan, Australia, South Korea, Hong Kong, Singapore and Taiwan. These nations form a cluster of **early adopters** with high Mobile Internet penetration rates and frequent service use.

Threshold countries such as China, India, Indonesia, Malaysia, Thailand and the Philippines have lower adoption rates, but they're expected to quickly catch up.¹⁷ **Other nations**, such as North Korea or Nepal, will need more time to develop a sophisticated Mobile Internet ecosystem.

Japan: Slowing growth in the region's top market

Within the group of early adopters, Japan stands out. It accounts for 75 percent of the region's Mobile Internet revenues. Following its impressive growth since 2003 of almost 60 percent annually, the Japanese Mobile Internet market today exceeds revenues of \$24 billion.¹⁷

Consumers have eagerly embraced Mobile Internet offerings, such as NTT DOCOMO's i-mode. Complex and interactive services, such as mobile payment, have enjoyed tremendous success, due in part to an early standardization of technology platforms, including FeliCa, a technology for contactless payments. Japan also boasts the world's highest average data revenue per customer—\$278—which is more than double the Korean rate, 8 times more than in China and 13 times more than India.



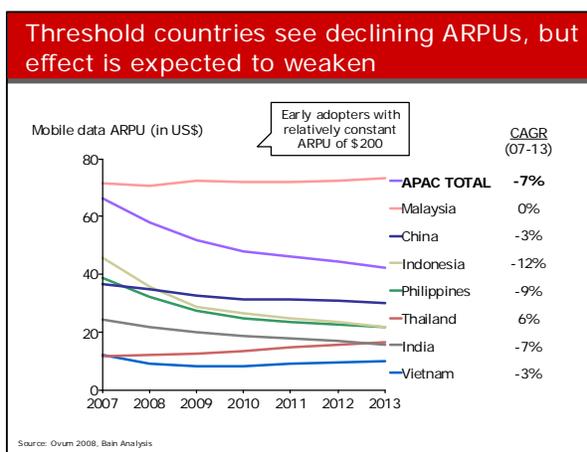
However, growth in Japan's advanced Mobile Internet marketplace is slowing: Over the next four years, annual revenue growth for the country's Mobile Internet sector is projected to be just 3 percent, compared with 11 percent for the rest of the Asia-Pacific region. Along with New Zealand, Australia is the only early-adopter country that is expected to exceed the region's Mobile Internet growth rate, with revenues projected to increase from \$450 million to almost \$700 million by 2012. Australia's growth, stemming from massive investments in 3G-networks, is also expected to deliver increased ARPU¹⁸ by 5 percent over the next five years—to \$226 per user by 2013. Japan, in contrast, is one of the very few developed countries in the world where the data ARPU is actually shrinking, from \$278 in 2008 to an expected \$255 by 2013.¹⁹

¹⁷ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

¹⁸ Average revenue per user p.a.

¹⁹ Ovum: Global mobile market outlook 2008-13 (2008)

Asia-Pacific: Emerging markets are catching up



In contrast to early adopters in the region, emerging countries are experiencing the complete opposite as revenue per user declines: the ARPU rate is not only far lower than in countries like Japan or South Korea, but it's also dropping at faster rates—by a projected minus-3 percent annually in China and minus-7 percent in India through 2013. This trend results from two market dynamics. First, intensifying competition in urban regions has put pressure on service prices, undermining revenues per user.²⁰ Second, mobile operators increasingly seek growth by expanding into rural regions where customers have lower incomes and less purchasing power. In China, the average salary

for rural workers is just one-third of what's paid to their urban counterparts, and this disparity in incomes is increasing.²¹ As a result, instead of profiting from higher revenue per customer, emerging markets in Asia-Pacific are pinning growth expectations on a rapidly expanding pool of users. China and India have the largest populations of mobile data users. By 2013, these two countries should account for half of all mobile data customers in Asia-Pacific and almost 30 percent of all of the mobile data users in the world.

For those reasons, Mobile Internet spending in Asian-Pacific emerging markets is expected to increase dramatically. China will be growth leader, benefiting from investments already underway, including the definition of 3G standards, which will allow wireless operators to upgrade their networks to 3G. China's Mobile Internet market is expected to increase at an annual rate of about 27 percent over the next four years—from \$4.2 billion today to \$11 billion by 2012. Countries such as Pakistan, Vietnam and India may see even higher annual growth rates of about 90 percent, but they're starting with lower mobile phone penetration. India, with the world's second-largest population, has a negligible Mobile Internet market share, totaling only \$0.2 billion in 2008—about the same size as Hong Kong, while much smaller Indonesia's Mobile Internet market produced \$1 billion in revenue.²² Still, India's market has some of the best potential in the region, especially after the launch of i-mode in 2007 and followed by the introduction of 3G services in 2008. By 2012, India's Mobile Internet spending may total \$2.6 billion.²³

Key uncertainties

- How to overcome network infrastructure (backhaul) bottlenecks?
- What are better solutions for rural populations (lower costs, alternative power sources)?
- How to ensure emerging markets have the software development capabilities to create applications for local needs?

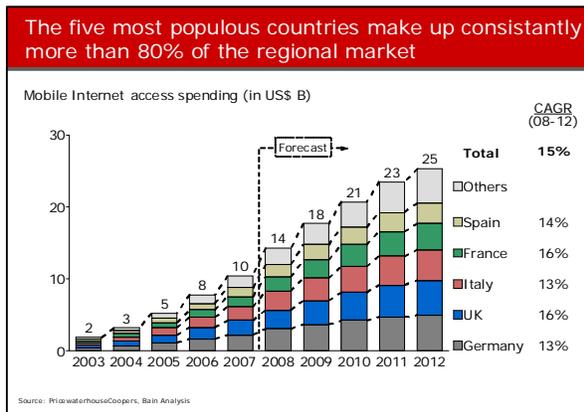
²⁰ IDC: People's Republic of China, India, and Korea Mobile Carrier Capex 2007–2011 Forecast and Analysis (2008)

²¹ Chinese National Bureau of Statistics (2006–2007)

²² So far, Indonesia's Mobile Internet market has been primarily driven by rising demand in the urban areas and among its growing middle class. Despite persisting market challenges such as regional complexity (up to 6,000 inhabited islands) and economic diversity, analysts expect continuing growth as operators increasingly address lower income users. See for example Ovum: Indonesia mobile market (2008)

²³ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

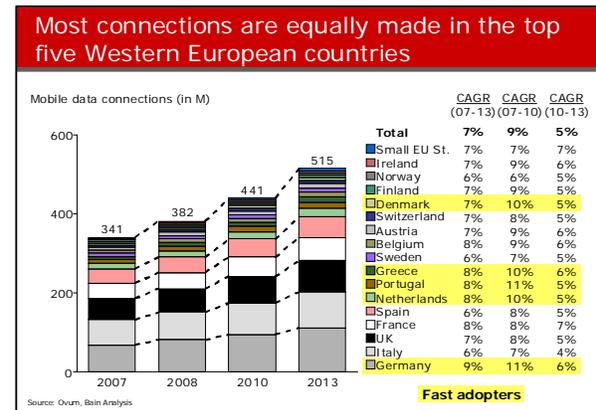
Western Europe: Stable growth, Mobile Internet access services under commoditization pressure



Western Europe has the world's second-largest Mobile Internet market, with 2008 revenues of \$14 billion. Germany generates one-fifth of the total, followed closely by the United Kingdom and Italy, with about \$2.6 billion in revenues for each country. Together with France and Spain (with \$2 billion and \$1.7 billion, respectively), these countries make up more than 80 percent of the European Mobile Internet market. No dramatic shifts are expected through 2012: Over the next five years, these key markets should grow at the average Western European rate of 15 percent. Although some countries in the region achieve impressive growth rates of 30 percent or more, that is an infrequent occurrence, and these five major markets will continue to dominate the Western European market.²⁴

Currently, the region's 382 million mobile data connections equal approximately 15 percent of all connections worldwide. Densely populated Germany and Italy are in the lead (82 million and 70 million users, respectively); the UK follows with 60 million users; France and Spain each have 40 million mobile customers). Three out of every four Western Europe mobile data services users live in these five countries.²⁵

Till 2013, Germany is projected to have the highest growth rate in the region. There is a group of "fast-adopters" (Germany, Netherlands, Denmark, Greece and Portugal), which are growing at more than 10 percent p.a. until 2010, but lose this momentum to a large extent after 2010. In contrast, a second group of "steady-adopters" (most prominently France, Norway and some smaller states) do not share the high initial growth rates of the first group, but ultimately reach the same levels by 2013.²⁵



Interestingly, it is equally the group of "fast-adopters" that have rather low customer values. In fact, together with Sweden, their average revenue per customer is at the lower end of the ARPU spectrum. There's a broad ARPU range among "fast adopters": with a low of \$75 in Greece to a high of \$211 in Ireland in 2008.

By 2013, two differences will be striking in Western Europe: First, the wide range in ARPU rates will tighten, from \$91 in Greece to \$210 in Ireland. Second, many countries will see their data revenue per customer rates settle in at the higher end of the scale—at about \$150. None of the "fast-adopters" are expected to be in this group.²⁵

The flattening ARPUs are mainly caused by price deterioration. Prices are decreasing for multiple reasons. First, competition in Western Europe remains intense; on average, there are three to four operators in each country.²⁶ The battle for the customer is intensifying: In the UK, the average monthly churn rate for mobile subscribers in the first quarter of 2008 was 2.98 percent, compared

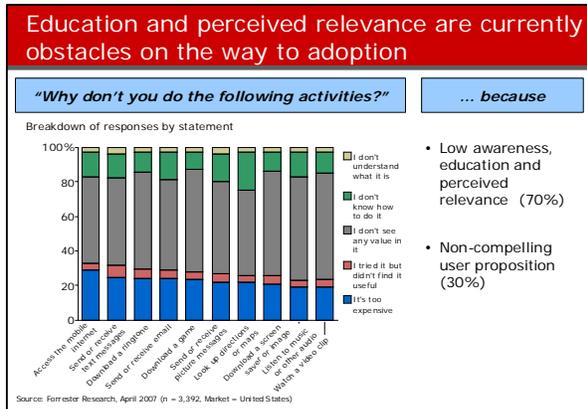
²⁴ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

²⁵ Ovum: Global mobile market outlook 2008-13 (2008)

²⁶ Analysys Mason: Telecoms Market Matrix (2008)

with 1.94 percent in 2004.²⁷ Second, the European Commission continues to impose price cuts on the wireless market: prices for trans-border browsing and text messaging are expected to drop significantly, by as much as 60 percent for texts.²⁸

North America: Competition for the premium customers tightens

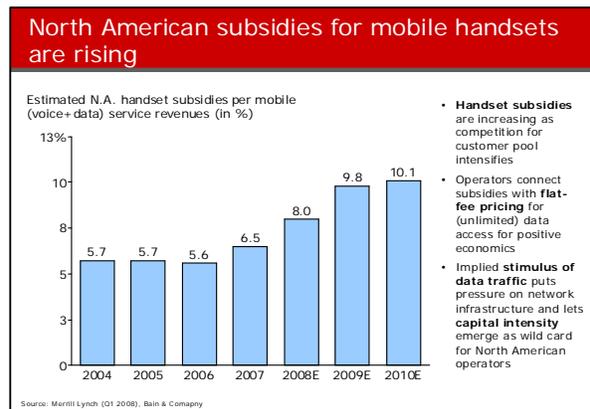


North America is the world's third-largest market for Mobile Internet services, totaling \$9 billion in 2008. In just two years, the sector has more than doubled in size, with growth outpacing Western Europe. The region is expected to continue expanding at a faster rate than the global average, doubling its market share again by 2012, for a total of \$19.2 billion in revenues.²⁹

North America's growth does not result from a strong increase in customer penetration. In fact, Mobile Internet connections are increasing at an annual rate of just 11 percent, behind the global average of 14 percent. Higher prices aren't the

major reason customers aren't signing for mobile services. When asked, 70 percent of Americans say the key reasons are low awareness and uncertainty about the value of Mobile Internet services. To overcome these hurdles, mobile operators should focus on educating consumers, especially about how Mobile Internet access can improve their lives.

What is powering North America growth? A surge in revenues per user: the ARPU, which started at a relatively low level,³⁰ is expected to grow 12 percent annually through 2013. This is by far a higher rate than in any other regions, especially when compared to the global average of just 1 percent. As a result, competition for the most valuable customers is likely to intensify. To win and keep these customers, US telecom operators are taking a number of steps, including increasing their handset subsidies. These are expected to rise from 6.5 percent per service revenues in 2007 and 8 percent in 2008 to more than 10 percent in 2010.³¹ Subsidies for each iPhone, for example, are estimated at about \$400, considerably higher than for any other smart phone.³¹ The business case for these hefty subsidies relies on generating a significant increase in net revenues per user. Operators are trying to achieve this by introducing flat-fee price structures that give users unlimited data access³¹ and encourages users to log onto fee-based services.



The wild card in the North American market is whether mobile operators' massive infrastructure investment will pay off by increasing data traffic. They've invested billions to deploy 3G spectrum and network improvements. In 2007, wireless carriers made more network enhancements. Verizon Wireless and Sprint Nextel upgraded their networks to enable 3G technology, which increases speeds from 600 kilobits per second (Kbps) to 1.4 megabits per second (Mbps). They've already

²⁷ Wireless Intelligence (2008)

²⁸ Rethink Wireless (2008)

²⁹ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

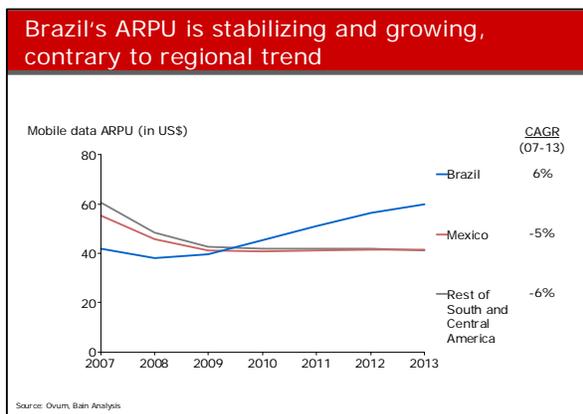
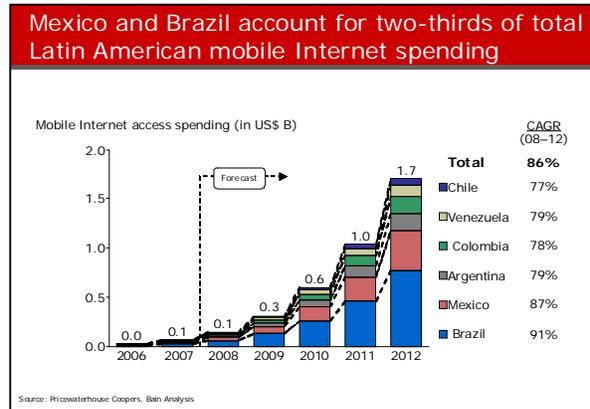
³⁰ Average annual revenues for mobile data services per user in North America is about \$103 (2008), relatively low in comparison with other industrial countries (Ovum 2008)

³¹ Merrill Lynch: Global Wireless Matrix (Q1 2008)

mapped out the next step: The Next Generation Mobile Networks initiative, formed by several network providers, hopes to launch a 4G standard, with speeds of more than 100 Mbps, in 2010.³²

Latin America:³³ Infant markets with high anticipated growth

In contrast to other regions, Latin America's Mobile Internet market is not highly developed. Today, the region's Mobile Internet access revenues are less than revenues in Greece. However, the region is expected to grow at an annual rate of more than 85 percent through 2012 (compared with a global average of 16 percent). Even then, the region will make up less than one-tenth of all North American revenues. Brazil is the region's largest market for mobile access services, followed by Mexico. Together, Brazil and Mexico account for almost two-thirds of the total Latin American marketplace — with their market share continuing to rise into 2012.³⁴ The rapid expansion of these two markets is due to their large user base. More than half of Latin America's mobile data services users are located in these two countries, and that is not expected to change for the next five years.



Brazil also is expected to have a higher average revenue per user rate than the rest of Latin America. While the region's ARPUs generally have fallen to around \$40 where they have stabilized, Brazil's revenue rate per customer is growing. Beginning in 2007, Brazil has seen an average increase of 6 percent annually. By 2010, Brazil should surpass the rest of Latin America by 2013, reaching \$60 per user.³⁵

Despite stabilizing ARPUs and growing connectivity, the Mobile Internet market in Latin America will remain in its infancy for the immediate future, with limited growth of the

region's wireless infrastructure. Mobile operators are focusing their 3G network investments first on urban areas, and then will move to rural areas.

In addition to slow infrastructure development, customer appetite for Mobile Internet services in Latin America is curbed by relatively high prices. Operators are reluctant to lower the price as a way of attracting untapped customer segments because of three concerns: the possible erosion of their wired Internet revenues, the impact of increased mobile traffic on the existing infrastructure and pessimism about profitability. In addition, the market structure itself might discourage competitive pricing in some countries: In Colombia, for example, one operator (of three in total) accounts for two-thirds of all connections; in Mexico, the top company has 70 percent of all Mobile Internet revenues.³⁶

³² PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

³³ Defined for the purpose of this paper as all American countries except for the USA and Canada

³⁴ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

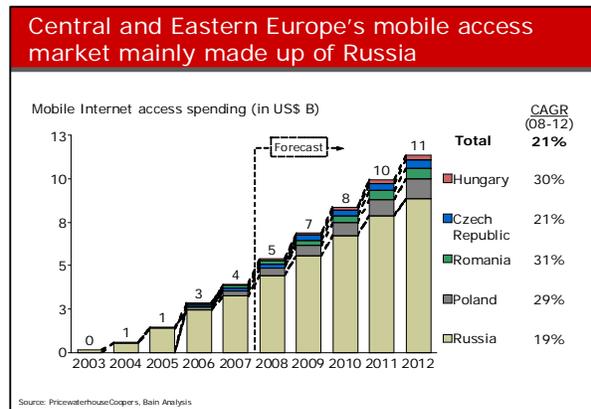
³⁵ Ovum: Global mobile market outlook 2008-13 (2008)

³⁶ Wireless Intelligence (2008), based on Q1 2008

Central and Eastern Europe: Bypassing limited wired infrastructure

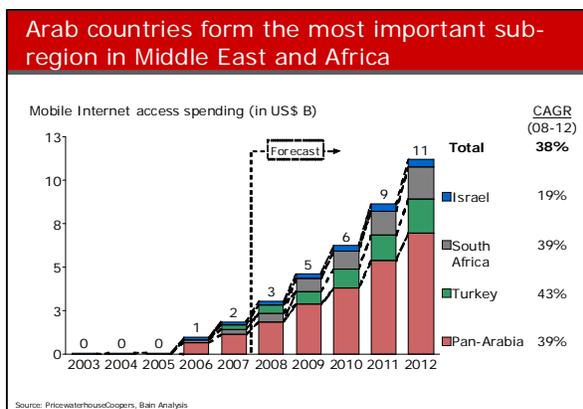
In the Central and Eastern European region, one country dominates this large and diverse Mobile Internet marketplace: Russia. In 2008, Russian mobile access spending totaled almost \$4.5 billion, making the country not only the most important market in Eastern Europe, but for all of Europe. Russia has a 50 percent lead in Mobile Internet spending over Germany, relegating it to No. 2 in the European market. Russia's position will become even stronger until 2012, when its 19 percent annual growth rate is expected to exceed other major Western European countries (Russia's Mobile Internet revenues may reach an estimated \$9 billion). Within the Eastern European region,³⁷ Russia is growing at a slower pace than other countries because its mobile market is much more developed.³⁸

Given Russia's relatively low gross domestic product—just over \$9,000 per capita (and ranking 56 globally),³⁹ the advanced state of its Mobile Internet market is surprising. The reason for this paradox is two-fold: Russians are highly motivated Mobile Internet users because they have few options. They lack wired Internet access—household penetration in Russia is just 22 percent, compared with 41 percent in Hungary and 45 percent in Poland.⁴⁰ 12 percent of all Russian households have broadband access—the broadband access rate for Western European households was 12 percent in 2003.



This lag in wired Internet development has created a wireless market boom. Compared to wired alternatives, mobile services are suited better to cope with some of Russia's unique market conditions: Large distances and harsh weather create a greater challenge for fixed infrastructure and make Mobile Internet devices the preferred choice of Russian users. Almost 185 million Russians have mobile phones, with more than 130 million data connections—that equals almost 50 percent of the data connections made by users throughout Central and Eastern Europe. In fact, Russia has the highest growth rate for mobile data and voice users in the region from 2007 through 2013.⁴¹

Middle East and Africa: A widely varying market with an uncertain path



Of all the regions, we found the most drastic disparities among Mobile Internet services in the Middle East and Africa. The region encompasses fast-growing sectors to countries with minimal adoption. But throughout the entire region, the potential for growth is enormous. The Mobile Internet service marketplace runs the gamut: Developed and emerging countries such as South Africa, Turkey and many Arabic countries already have active Mobile Internet populations. Meanwhile, African countries will require time to develop vibrant markets,

³⁷ Poland, Hungary and Romania, for instance, reaches growth rates of 30 percent p.a. and above

³⁸ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

³⁹ International Monetary Fund: World Economic Outlook (2008)

⁴⁰ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

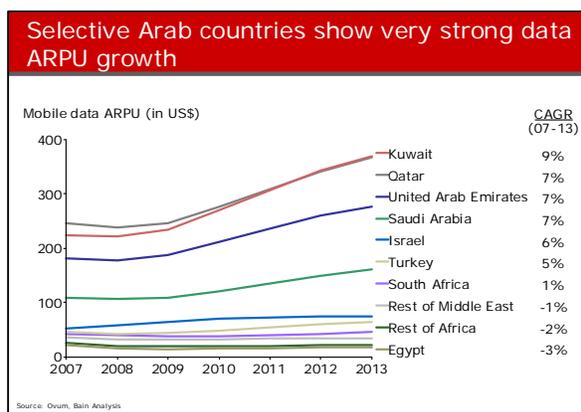
⁴¹ Ovum: Global mobile market outlook 2008-13 (2008)

especially in sub-Saharan Africa where little activity can be observed. The potential of the sub-Saharan region is apparent with the success of applications like M-PESA, a mobile payment service introduced by Vodafone and Safaricom in Kenya in 2007. It has developed quickly into a mass market application with almost 4 million users.⁴² However, isolated successes like M-PESA are unable to trigger the large-scale adoption needed to support a dynamic Mobile Internet market. This might change as innovative services like M-PESA spread—it's now available in Tanzania.

Just how Mobile Internet services in Africa will evolve is more uncertain than in any other region. Development is stymied in part by the absence of a comprehensive regulatory framework with the kinds of market-based incentives and subsidies needed to encourage investments to rural areas. The potential for Mobile Internet services to bypass the lack of a fixed infrastructure is huge. Expansion also is constrained by the lack of content and applications tailored to the interests of local users, limiting the usefulness of Mobile Internet services. Creation of compelling, localized content should be a top priority for African countries.

Only South Africa seems to be on a clear development path. The South African Mobile Internet market has an impressive annual growth rate of 40 percent, generating almost \$0.5 billion in revenues. By 2012, revenues are expected to increase by almost 300 percent, reaching nearly \$2 billion.⁴³

The rapid growth of the South African market is similar to the expansion of Mobile Internet access in the Arabian region. The major difference is the size of the Arabian marketplace. Currently, Saudi Arabia and the pan-Arabic sub-region⁴⁴ account for almost \$2 billion in revenue, with a projected increase to \$7 billion 2012. Both Arabia and South African users are signing up for Mobile Internet services because their options are limited:⁴⁵ only about 10 percent of the population has wired broadband access and that number is expected to stay under 25 percent⁴⁶ for another four years.⁴⁷



In addition to an increasing customer base, Arabia's Mobile Internet growth is boosted by rising data revenue per customer. Data ARPU growth rates of 5 percent for most countries in the region can be observed.⁴⁸ In fact, Kuwait and Qatar (with \$370 and \$367, respectively) will have the highest data ARPUs in the world in 2013. Over the next four years, no other country is expected to pass the \$300 threshold.⁴⁹

⁴² CGAP: Lessons from M-PESA

⁴³ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

⁴⁴ Comprises Algeria, Bahrain, Egypt, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Syria and the United Arab Emirates

⁴⁵ South Africa does, however, dispose over significant dial up capacities, as penetration exceeds 50 percent and shrinks only significantly from 2011 on.

⁴⁶ Turkey, in contrast, reaches already today broadband penetration rates of 30 percent.

⁴⁷ PricewaterhouseCoopers: Global Entertainment and Media Outlook 2008–2012 (2008)

⁴⁸ Except for the USA

⁴⁹ Ovum: Global mobile market outlook 2008-13 (2008)

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Cross-Industry Collaboration: Mobile Banking

Executive summary

For the past decade, mobile banking and payments have been heralded as a powerful growth engine for Mobile Internet services. In a few markets — Japan, Korea and Kenya — these expectations have been realized. Customers, especially in Japan, are avid users of mobile transactions. But in most industrialized nations, mass-market adoption of mobile banking still is far off.

For once, technology is not the barrier. All the technological requirements are in place and are being increasingly standardized. Instead, the issue is overcoming “system inertia” to reach a tipping point—a critical mass of companies, both within and across sectors, with enough scale and breadth to kick start the mobile banking segment.

Still, the anticipation is one of fast growth from a very small base for the next few years. By 2012, many industry observers estimate that the mobile payment transaction volume in North America and Western Europe will increase by *more than tenfold*.¹ In emerging nations, mobile payment solutions such as M-PESA in Kenya or Grameenphone’s BillPay in Bangladesh have been quickly embraced by the mass market. And in the past year, telecom operators, financial service providers and third-parties have stepped up their activities, including the launch of online payment platforms.²

Industry participants are pursuing three approaches.

1. **Go it alone** where, for example, telecoms take the lead in aligning the value chain, providing the investment capital and even expand into financial institutions like NTT DOCOMO did in Japan. The financial sector also has seen several go-it-alone attempts, with banks launching virtual network operators, like the Dutch Rabobank Group.
2. **Collaboration within the industry** such as the Global System for Mobile Association’s (GSMA) initiative, which is promoting a unified approach by the mobile industry to unlock some of the barriers to mobile banking and payment.
3. **Collaboration across industries** is exemplified by the French Pegasus project, where multiple banks, telecom and technology providers joined forces to establish a contactless payment solution. Value-added service providers such as Bharti Telesoft or Qualcomm’s Firethorn are using independent mobile banking platforms to link themselves with consumers, telecoms and banks. And telecom companies like MTN Banking in South Africa have formed exclusive partnerships with a single financial service provider.

It is important to understand which of those approaches has the greatest chance of success and how mobile banking varies by region. Equally important, industry participants must consider the potential value that can be unlocked versus associated costs.

One lesson is clear from the success and failures of past initiatives: The ones that do best are those that achieve a critical mass of total customer and merchant transactions. It’s rare that one participant is able to rally the entire system on its own, which is the case in Japan. In most markets, this go-it-alone strategy will be hard to replicate. Instead, initiatives developed through strategic partnerships, either within or across industries, will be required to make progress. Coalitions also involve risk—to date, consortia and industry initiatives have a poor track record of rapidly advancing their agendas.

¹ E.g., Ovum 2008, Juniper Research 2008

² At least fifteen major initiatives on contactless payments or mobile money transfer have been started in the US, Europe and selected Asian countries since September 2007 (Ovum 2008)

To ensure success, all initiatives—no matter which approach is used—must include six key fundamentals:

- 1. Understand and preferably align the interests of all participants**
Customers, merchants, telecoms, financial services providers and governments have different incentives. Business models need to ensure win-win solutions for a majority of the industry participants. They also need to have the flexibility to bypass critical participants who become resistant.
- 2. Support one standard technology**
Solution fragmentation hinders overall merchant and customer adoption.
- 3. Ensure adequate investment**
Significant investment is needed to roll out the kinds of innovative devices that will trigger mass-market adoption. Investing is more economically viable when shared among multiple stakeholders.
- 4. Create an easy to use solution for merchants and consumers**
Counter skepticism from merchants and customers with a reliable service delivery platform and simple, secure user interfaces.
5. Start the rollout of services from areas with a high density of prospective merchants and customers. Payment solutions without a critical mass of prospective users will fail.
- 6. Ensure public sector support regarding both the regulatory framework and the business case development**
Prove to governments the social and economic benefits of reducing transaction and system costs, as well as improving security. At the same time, address the regulatory obstacles that stand in the way of adoption.

Market status and outlook

Since the late 1990s, banks and telecom operators have offered mobile banking services—the Dutch bank ABN AMRO launched its first mobile service for stock traders as early as 1997. Around 2000, many North American and European banks offered services based on Wireless Application Protocol (WAP)—although they were discontinued some years later due to lack of user adoption. More recently, telecoms and financial services providers have returned to the sector, using various technologies such as text messaging, WAP, faster and richer 3G networks or Near Field Communication (NFC) for mobile payments, providing a diverse portfolio of mobile banking services, ranging from information-only to interactive transactions.

For this discussion, we will define the mobile banking sector as having four distinct segments. We have focused on the first two segments, **mobile payments** and **mobile money transfer**. Both areas have more activity and higher potential for the kinds of new business models that are blurring the boundaries between the telecommunication and financial services industries.

- 1. Mobile payments (including contactless solutions)**
Consumers can use their mobile phones at businesses equipped with payment readers. The most recent technological advance is Near Field Communications (NFC), which is designed to work with mobile phones and operate over very short distances, typically less than four inches (10 centimeters). For users and merchants, NFC provides superior convenience over basic contactless smart card technology, enabling the use of mobile phone features like the screen, communication link, keyboard and memory.
- 2. Mobile money transfers**
Customers are able to perform fund transfers from the user's mobile account to another account over the cellular network. They either access their existing bank accounts or

mobile-specific accounts to perform these transactions. This includes international money orders, providing a quick and easy way to transfer money across borders.

3. **Mobile Internet shopping**

Shoppers use their mobile phones to remotely purchase products; merchants enable online shopping with a mobile phone browser, a mobile Java application or using text messaging to place orders. This may use existing payment instruments (debit or credit cards) or mobile-specific payment schemes such as PayPal Mobile.

4. **Advanced mobile banking services**

These services include using mobile devices for everything from applying for a credit card to stock trading. Typically, users access their bank accounts, which are linked to advanced banking services. While many banks provide one-way information for stocks, account balances and other requests, truly interactive services are less developed.



In 2007, global mobile banking transactions reached an estimated \$12 billion,³ with mobile contactless payments representing only about \$3 billion. Mobile banking still is just a fraction of 2007's \$32 trillion in total personal expenditures, worldwide.⁴ Japan is the most developed mobile banking market, where mobile contactless payments and Mobile Internet shopping have high adoption rates. However, industry observers expect to see substantial market growth over the next years, with projections of almost \$150 billion in total transaction volume by 2012. That would translate into an impressive increase of more than 60 percent annually.⁵

By breaking down that \$150 billion, we can track projected trends: Mobile contactless payments are expected to account for one-third of the growth as adoption rates rise in North America and Europe. Money transfers will contribute nearly 40 percent, with emerging nations, such as Africa, China, India and Southeast Asian countries, grabbing a large market share. And 27 percent will come from mobile shopping, with Japanese consumers still dominating the segment in 2012.

In spite of this increase in transactions, the amount of revenue generated will be a small percentage. Assuming a hypothetical 2 percent average commission on all purchases and money transfers, the total global market value, worldwide, is projected at only about \$3 billion—and about \$700 million for the North American and Western European market. Telecom and financial services companies will need to rely on additional sources of revenues, such as mobile advertising or increased loyalty, to justify their investments. In the long run, revenue growth should take off once the infrastructure is established and consumers start using mobile payments in place of cash-based transactions.

Barriers and key success factors

The major barriers to mobile banking, as well as a lack of consumer demand, are rooted in the divergent interests of the various stakeholders.

³ Value of transactions based on mobile payments, mobile money transfers and Mobile Internet shopping, excluding advanced mobile banking services (Ovum 2008)

⁴ Euromonitor

⁵ E.g. Ovum, IDC 2008

While consumers have quickly adopted mobile payment options that offer convenience, they remain concerned about security, with good reason, and too often they are unaware of mobile banking's benefits. Consumers in many market segments, especially in developed nations, express little interest in more advanced mobile banking applications. In North America, nearly half of all online bank users say they "don't see the point" of mobile banking. A mere 13 percent are likely or very likely to use their mobile phone for mobile payments.⁶ Young users are the most willing adopters, but they point to poor interface design, lack of merchant acceptance and security issues as barriers.

Each of the industry participants has a role in erecting these barriers to mass-market adoption.

Universal merchant adoption of mobile banking technology is an important pre-condition for large-scale consumer adoption. But because payments are not their core business, merchants are not taking the lead. They serve as facilitators, who are more likely to "follow" and adopt only a limited number of standards—and stick with the most accepted ones. Merchants want low transaction costs, high transaction volumes, inexpensive payment terminals, and fast and secure service.

Telecom operators are defending their core business by locking customers with value-added services into their networks and maximizing network usage. They're relying on access to new profit pools, such as financial transaction fees and mobile advertising, to replace diminishing revenues from basic voice and data services. Converting existing telecom consumers into mobile payment users is critical to telecoms' long-term success. Analog, **device and smart card manufacturers** strive to develop into full-service providers to counter shrinking traditional markets. This implies competition for the same profit pool and same customers although customer prioritization might differ in relatedness to existing footprints.

Financial service providers also seek to preserve their core business, which is under pressure.⁷ Mobile banking offers both opportunity and new risk. The channel can replace dwindling revenues, but at the same time it presents a threat as new entrants attack what have been well-protected profit pools. Banks want low transaction fees charged back to telecom providers and a high transaction volume.

Regulators and governments are required to provide a supportive, overarching legal and regulatory framework. Public entities have a major stake in promoting mobile banking solutions as these are levers to lower transaction costs and increase the productivity of financial systems. A top priority should be resolving liability questions, such as who is responsible if payments aren't completed due to technical problems. Existing and anticipated laws provide some guidance. For example, the European Commission's Directive on Payment Services, which will be implemented in EU member states in November 2009, will allow alternative providers, such as mobile phone operators, to deliver new payment services alongside banks and credit card firms, paving the way for a more efficient, cash-free economy. However, details of how the rules will be implemented in member states remain unclear.

Past initiatives show that the soundest business models rely on a critical mass of both consumers and merchant transactions. To ensure that consumers use mobile banking services on a regular basis, merchants or customers will want a portion of their transaction fees covered to help pay the cost of an extra terminal at the point of sale or a device chip.

To lower barriers to adoption, telecoms and financial services providers must develop business models that address the interests of all the stakeholders. Six factors provide the foundation for these win-win initiatives:

⁶ Forrester: Connecting The Dots to Mobile Banking and Payments (2008)

⁷ E.g. the introduction of SEPA ("Single European Payment Area") has resulted in decreasing revenues from transaction charges

1. **Understand and preferably align interests of all the participants**
Generally, it is difficult for a single participant to succeed on its own. Telecoms and financial service providers depend on each other. When designing business models, they need to ensure that every stakeholder's interest is reflected. Various models are emerging to help resolve likely differences over revenue sharing, customer access, customer prioritization and costs. They include open versus restricted collaboration versus go it alone strategies as outlined in the following section.
2. **Support one standard technology**
Avoid creating yet another niche application. Provide the one solution that will win acceptance by the mass market. Don't get mired down in technological complications; and exploit the solution's ability to create ease-of-use by consumers through technology convergence.
3. **Ensure adequate investment**
Developing and launching a standardized technology for mass markets requires substantial investments as well as promotion and cross-selling support.
4. **Create an easy to use solution for merchants and consumers**
Counter general customer skepticism and lack of demand with a reliable service delivery platform and simple, secure user interfaces.
5. **Start the rollout of services from areas with a high density of prospective merchants and customers**
Successful mobile contactless payments and mobile money transfer rollouts happened in places with very dense populations, using transport and convenience stores as anchor merchants. Avoid markets with fragmented merchant presence.
6. **Ensure public sector support both in regulatory framework and business case development**
Prove the social and economic benefits of mobile banking to governments, including reduced transaction and system costs along with improved security. Address regulatory obstacles that may stand in the way of achieving a critical mass of users.

Emerging business models

Mobile banking business models vary significantly across industry segments. Even within those segments, no best practice model has emerged. The main stakeholders—telecom operators, banks, handset and smart card vendors, consumers, merchants, third-party providers, governments and regulators—are participating in very different ways. In particular, telecoms and financial services providers have so far demonstrated two distinctive approaches⁸:



Collaborative-based business models

Cross-industry collaboration (segment to segment): Multiple telecoms and multiple banks
Examples include the Norwegian BankID project, spearheaded by leading Norwegian banks, with telecom operators such as Telenor probably actively promoting the service; and the French Pegasus project that has piloted a mobile contactless payment service. The Pegasus project includes various participants, among them four French mobile network operators and

⁸ See also: Ovum: Mobile payments—progressing toward large-scale deployments (2008)

seven large French banks.

Mobile providers offering additional services have developed independent mobile banking platforms. Examples include software providers such as Bharti Telesoft, SMobile Systems or eLeader. Increasingly, these market participants tend to be using full-fledged transaction processing platforms to connect users, banks and telecom operators. Companies like Monitise (in the EU) or Firethorn (in the US) have demonstrated the soundness of this “middleman” approach. The 2007 acquisition of Firethorn by Qualcomm attracted attention to this hub-based business model.

Cross-industry collaboration (One to one—One telecom, one bank)

Examples include the BankInter-KPN partnership in Spain, M-PESA in Kenya (a money transfer service lead by Vodafone but with the support of a local bank) and MTN Banking in South Africa (a joint venture by the local mobile operator MTN and Standard Bank).

Intra-industry collaboration

Examples include the GSMA initiative “Pay by Mobile” to establish contactless payments standards and to subsequently pilot applications with the financial services industry.

Go it alone strategies

Telecom only: The telecom industry is taking over the bank’s role

Examples include DOCOMO in Japan or Mobilkom in Austria which both expanded into financial services in order to provide mobile payment services.

Bank only: The bank becomes a virtual network operator

For example, the Dutch Rabobank Group launched the virtual network operator, RaboMobiël, to support its mobile banking platform.

Independent player only: End-to-end proposition without banks and telecoms

PayPal Mobile, the extension of eBay’s online payment platform, is a high profile example.

Depending on the approach, value chain participation of telecoms will differ significantly. Either telecoms will manage an end-to-end mobile banking service or they will focus on providing the technological infrastructure to enable such services. The first model, while more attractive for telecom operators, often is viewed by the financial services industry as a threat. As a result, banks are reluctant to join such telecom-lead initiatives. The second role is less attractive to telecom operators, which don’t want to be reduced to “pipes,” with no access to end users of mobile banking services and profit pools.

Selected initiatives

Past and current business models demonstrate how the fulfillment of the outlined success factors actually drive chances for services to win mass-market acceptance.

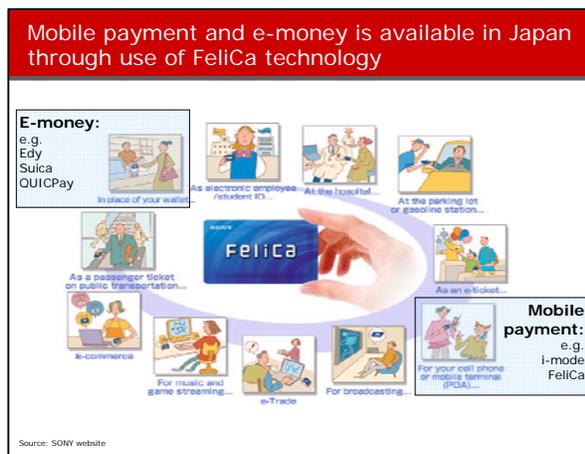
DOCOMO—Success in the Japanese mobile contactless payment market

The Japanese market is far ahead of the rest of the world in developing mobile contactless technology, especially contactless payment technology. Sony’s FeliCa is the dominant standard for electronic money and other applications—about 35 percent of all Japanese mobile subscribers have a FeliCa-enabled phone. Japan is the largest mobile contactless payment market in the world, with about \$3 billion transactions in 2007. DOCOMO ranks as the country’s second-largest mobile contactless payment provider, after Edy, an electronic purse service that offers FeliCa-based payments, not only via mobile devices but also in combination with credit cards.

DOCOMO started its mobile contactless payment service by aligning interests of banks and technology vendors through acquisitions of large shares in both FeliCa and Sumitomo Mitsui Card Company, the credit card firm. As a result, it was able to resolve any revenue sharing questions

quickly and cross-sell the service across its own and the credit card firm's customers. In addition, as the dominant mobile player, DOCOMO had access to over 50 percent of all prospective customers from the start. With existing, reliable technology and additional investments in readers to push merchant adoption, consumers have eagerly adopted DOCOMO's services. By the end of 2007, DOCOMO had won 4 million subscribers, compared with 1.7 million at the start of the year.

Despite DOCOMO's success, it is unlikely that this go-it-alone approach can be replicated in other markets for two reasons. First, as the leading mobile operator without any close competitor, DOCOMO was able to reach a critical mass of users—its access to Sumitomo Mitsui Card Company customers accelerated user adoption. Second, FeliCa was already established as the standard technology platform, not only in electronic payments, but also in adjacent areas such as transport and identification (ID) management. These advantages lowered adoption barriers.



M-PESA—Mobile payments and money transfers catch on in Kenya

In February 2007, Vodafone teamed with Kenya's mobile operator Safaricom to launch "M-PESA", a text messaging-based mobile payment and money transfer service. M-PESA provides a viable alternative to Kenya's formal financial services system. The service fills a huge void. An estimated 80 percent of adult Kenyans do not have a bank account,⁹ making it especially difficult for urban Kenyans to support their relatives in rural areas.

M-PESA provides users with a mobile electronic account. They use text messaging to save and transfer money, not only between other M-PESA account holders, but also to non M-PESA users, such as subscribers of other mobile operators.¹⁰ Users can withdraw or deposit cash at any of more than 4,000 local agents¹¹, typically a member of Safaricom's distribution network, which in turn receive a transaction-based commission. This simple and easy-to-use mobile payment method works with most 2G network cell phones and is primarily aimed at person-to-person transactions.

Safaricom offers M-PESA only to its subscribers, who pay a fee for every transaction—the fee is higher when sending money to non m-PESA users. Safaricom positions the service under its own brand—it does partner with a local bank, which manages the electronic accounts and is legally responsible for any financial liabilities.

After 18 months, nearly 4 million mobile users had signed up for M-PESA—compared with about 5 million traditional deposit accounts in all of Kenya.¹¹ Vodafone has launched similar services in other countries, including Afghanistan and Tanzania.

GSMA "Pay-Buy-Mobile"

Pay-Buy-Mobile is a Mobile Network Operator (MNO)-led initiative by the Global System for Mobile Association, launched in 2007, for using mobile phones to make payments in a retail environment using NFC technology.¹²

⁹ Financial Sector Deepening Trust Kenya

¹⁰ See also Ovum: Mobile payments: progressing toward large-scale deployments (2008)

¹¹ CGAP: Consultative Group to Assist the Poor

¹² GSMA 2007: Pay by Mobile – Public White Paper

Many mobile network operators back this initiative, which has two objectives: to create a contactless payments technology standard for mobile devices; and to pilot business models involving banks, credit cards issuers, device manufacturers, MNO's and a "Trusted Service Manager" (TSM). This TSM serves as the single point of contact between the network operator and banks, lowering complexity and accelerating integration of the technology among the different market participants. The role of the trusted service manager can either be taken by MNO's, banks or independent parties.

In the MNO-centered model, the MNO builds and integrates TSM capabilities within its proprietary network infrastructure, offering a secure and open interface to financial services providers. Banks make no investments in the TSM infrastructure and must integrate each MNO separately.

In the financial services provider-centered model, the bank acts as the TSM and integrates participating mobile network operators in the market. The bank makes the necessary investments in building the TSM infrastructure. Mobile network operators have to integrate each bank separately.

In the independent entity model, a trusted third-party performs the TSM role and acts as the single point of contact between all participating mobile network operators and banks in the market. This model removes the need for either the mobile operator or the bank to make an investment in the TSM infrastructure.

Paybox—Initial drawback in the European market

In 1999, Paybox started a text-based "Text-to-Buy" service in Germany, Austria, Sweden, Spain and the UK. Registered users could make payments to other, not necessarily registered merchants and users, via text messaging. Paybox acted as a bank intermediary, authorizing transactions between existing bank accounts. Merchants paid most of the transaction fees. The company recruited by 2003 nearly one million users and was rated by industry analysts as one of the leading companies in the sector.

However, consumer adoption rates stagnated, forcing the company to withdraw from most markets. Despite a reliable transaction platform, Paybox failed to overcome some critical issues: The complex registration process deterred some users and there was low awareness of the service in the broader market. In addition, the company was unable to establish cooperation between the supporting bank and telecom operators, who ultimately withdrew their financial backing.

Under new ownership, the firm started to focus on the business-to-business market in selected regions and regained market shares. Today, more than 5 million end users and 20,000 merchants use the system within and outside Europe.

New kids on the block: PayPal Mobile

Since 2006, PayPal, eBay's proprietary online payment service, introduced two mobile payment applications in North America and the UK: the text-based "Text-to-Buy" enables instant person-to-person payments or purchases, while the wireless application protocol-based PayPal Mobile Checkout allows Mobile Internet shopping on eBay and other selected merchants. PayPal fees are paid by merchants.

PayPal's mobile services combine several strengths: they benefit from a critical mass of buyers and merchants already using PayPal services; the necessary infrastructure is in place in many markets; and it has an established reputation as a trusted payment vehicle. Given its strong starting position, PayPal has yet to partner very broadly with telecom and financial service providers. However, its mobile payment services are still relatively low in penetration. It is unclear if the application can develop into mass-market services without broader support from the telecom and banking industries.

Conclusion

Currently, telecoms, financial services providers and third parties are working in a wide range of arrangements with varying degrees of collaboration. One lesson is clear from the performance of several mobile banking initiatives: aligning all the stakeholders' interests is mandatory for success. One-sided, competitive moves which had been successful in the past will be hard to replicate on a global scale. To create a winning approach, several key success factors have to be met to achieve this alignment; however, concrete approaches must be tailored to specific market needs.

In order to accelerate mass-market adoption of mobile banking and payments, the diverse group of industry participants must come together to define and act on a coordinated agenda. Once unlocked mobile banking can be a very significant engine for the entire Mobile Internet.



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Cross-Industry Collaboration: Mobile Health

Executive summary

Healthcare in both industrialized and emerging nations is reaching a tipping point. In highly developed countries, aging populations and spiraling healthcare costs are pushing existing systems to the limit—and beyond. In emerging nations, there is an urgent need for comprehensive medical services to cope with increasingly fast-spreading diseases. Cost-effective and innovative healthcare solutions are a top priority for both the world's richest and poorest nations.

There is no doubt that IT and Telecommunications can play a critical role in addressing these issues whilst improving the quality of the solutions at the same time. Specifically, **Mobile health** (applications enabled by Mobile Internet and/or mobile devices) has the potential to play an important part, given the portability and personal nature of the devices. Already, some pilot projects in the United States and Europe (the UK, Spain and Germany) are demonstrating the potential benefits, including the ability to remotely monitor patients, dispense electronic prescriptions and trace inventory. Promising mobile solutions in emerging markets are changing the way disease and health emergencies are tracked as well as linking rural areas to remote healthcare education and providing split-second access to medical records and data. It is not difficult to imagine, a few years down the road, a win-win scenario in which individuals, private investors and public parties all mutually benefit from mobile health solutions.

However, today's reality is far from this possible future. Only a fraction of the global population benefits from what is already today technically feasible¹. There are a number of **barriers (on both the demand and supply side) which currently impede the scale development of mobile health solutions** in both the developed world and emerging nations. They include:

- Uncertain financial return on investments,
- A fragmentation of stakeholders and technologies,
- Lack of information standards (e.g., Electronic Patient Records),
- Unresolved liability and privacy questions.

As a result, private investors tend to focus on fairly narrowly scoped, specific solutions, customized for very specific groups of healthcare service recipients and providers. These solutions are often difficult to scale to mass markets – resulting in even greater technology fragmentation. This pattern creates a vicious cycle that slows the broad adoption of mobile health services.

However, there is **considerable activity in this area, in both the private and the public sector**. In the private arena, Telecom operators, device manufacturers and technology providers are working together with healthcare service providers to bring mobile health solutions to market and to define sustainable business models around these solutions (Qualcomm's mobile virtual network operator LifeComm or Vodafone's engagement with Medicronic in the EU patient monitoring sector are just examples of currently launched pilots). Simultaneously, public bodies are working to create market environments that encourage investments, like the EU under the i2010 policy renewal initiative².



¹ Analysts such as VitalWaveConsulting estimate the number of people in emerging countries served by mobile health solutions to fewer than 100,000 (*Landscape Analysis of mHealth in the Global South*, VitalWaveConsulting 2008)

² The i2010 initiative runs till 2010 and is designed to create a single European Information Space. It encompasses a series of regulation, funding for research and pilot projects, promotion activities and partnerships with stakeholders.

Developing growth roadmaps for mobile health will differ dramatically from nation to nation. Yet analysis of past and current initiatives yields some practical advice for market participants seeking to play an active role in shaping the mobile health space:

1. **Acknowledge that large scale public sector/ multi country initiatives to break down barriers will take time to implement. In the mid term, continue to invest in solutions at the national level, particularly where markets are inherently attractive or where an opportunity to proactively shape the national environment exists.**

So far, public initiatives to resolve supply and demand barriers on national levels, e.g. the setup of Electronic Patient Records, have moved at a relatively slow pace. The fragmented character of most industrialized health markets in terms of stakeholders and existing infrastructure complicates such top-down approaches. However, there are niches, such as remote monitoring for diabetics or patients with chronic heart diseases, which combine high market demand and relatively easy implementation. Investments in such segments are likely to deliver positive financial returns, along with triggering broader demand, the development of nation-wide standards and to help move participating organizations down the learning curve for these markets.

2. **Work with partners to deliver interoperability and standardization of technology and information**

Mobile health solutions will remain isolated, narrowly scoped applications with poor scale economics if they are not well integrated with other health services by common technology and information standards. Key standards such as Electronic Patient Records and the underlying infrastructure do not exist even within individual countries. The development of such norms in cooperation with Telecom and Technology providers, the Healthcare industry and public parties will accelerate the emergence of nation-wide norms and core infrastructure applications.

3. **Build on success stories to stimulate demand for more complex mobile health solutions**

Target new offerings at consumers and healthcare providers who already are sold on the benefits of mobile health services like remote patient monitoring. They will be more open to incorporating additional mobile offerings into their daily routines.

4. **Demonstrate (on the basis of successful initiatives) the business case and economic benefits to providers and governments to ensure mobile health services are included in financial reimbursement schemes**

Costs for mobile health services have so far rarely been integrated into national reimbursement schemes, partly due to their preventive character. Decision makers, governments and/or insurance companies will most likely act based on tangible cost savings and service quality increases demonstrated by mobile health solutions.

5. **Pro-actively support the definition of legal liability frameworks to stimulate consumer demand**

Consumer concerns about liability and data privacy have curbed their interest in mobile healthcare. All the market participants must encourage adoption of laws and regulations that detail the legal responsibility of mobile healthcare providers and protect medical records.

Many other major issues must be tackled before mobile health services can win mass-market acceptance. Several fundamental questions must be answered by the broad cross section of industry participants: How to adapt market development strategies to national health structures? How to resolve financing bottlenecks for private sector up-front investments? What are the emerging best practice solutions? What are business model blueprints around such applications? Which role will the Telecom operators and technology providers play? Despite these uncertainties the near future will be a critical time to pro-actively shape the ecosystems in the mobile health sector.

Market status and outlook

In industrialized countries, the healthcare industry has barely tapped the huge potential for using information and communication technology to reduce costs and improve patient care. For example, un-integrated patient data systems hamper communication among healthcare providers and lead to medical errors—some estimates project that the US could save \$60 billion annually by standardizing and fully integrating communication and information-sharing systems among healthcare providers, specialists, laboratories and insurance funds.³

Mobile health services are uniquely positioned to take advantage of innovations that personalize healthcare and cut costs: they are linked to an individual instead of a medical facility and they can provide information to patients and doctors remotely. Technological advances such as 3G networks, high quality video transmission, and more sophisticated sensors, enable advanced mobile health services. They include:

- **mobile health information**—patients have remote access to individualized healthcare information like as checkup alerts;
- **knowledge management and collaboration**—medical specialists can quickly exchange crucial information such as data about drug interactions while treating patients;
- **patient medical record management**—healthcare providers use mobile devices to enter and receive patient data, a basis for various adjacent applications such as electronic prescriptions;
- Possibly, the highest potential may come from **remote patient monitoring applications** which allow the monitoring of patients, diagnosis and physical or psychological treatment outside the boundaries of traditional points of care. By 2012, the global market for this service is expected to grow at a brisk rate of nearly 60 percent annually and total \$8 billion.⁴

Because of the market's potential, a host of companies and industry participants are launching competitive services, forming cross-industry partnerships, and collaborating on the technology needed to support the mobile health sector. In the remote patient monitoring segment, **specialist end-to-end service providers** such as Vitaphone, Myca Nutrition, Docobo or Card Guard provide integrated solutions incorporating specialized devices, software and back-office staff. **Telecom operators** have teamed with specialist providers like Vodafone and Medicronic in the Spanish market.⁵

Interestingly, innovation in device design tends to come from **specialist device manufacturers** like Polar or AMD Telehealth and less from traditional mobile phone manufacturers. **Technology providers** such as Oracle or Microsoft provide Electronic Patient Record platforms.⁶ Finally, also **insurance companies** such as the health benefits company Humana are pro-actively engaged in developing mobile health solutions.⁷

In contrast, emerging nations see little activity from the private sector. In a recent study, the Vodafone Foundation and World Health Organization found that out of fifty mobile health projects, less than 30 still were underway. Of those, the majority was sponsored by governments, private

³ See for example Walker et al.: The value of health care information exchange and interoperability, Health Affairs

⁴ Datamonitor 2007

⁵ Medicronic Salud is a leading telemedicine service provider in Spain. Together with Vodafone, Medicronic has established Medicronic-Vodafone Spain which operates a medical call center service. Fixed and cell phone technologies are used in combination with vital parameters measurements to monitor patients at home or at retirement homes.

⁶ E.g. Oracle, leveraging its strong position in the database market in the healthcare sector (e.g., in the UK 70 percent of NHS Trusts currently run on Oracle systems), has been designed the Healthcare Transaction Base (HTB). The HTB shall enable healthcare providers to create a comprehensive patient record that can be shared across institutions and geographic regions, so patients can be assured that their medical information follows them wherever they go.

⁷ Humana Innovation Enterprises—a subsidiary of the US based health benefits company—and Card Guard, a supplier of monitoring services for chronically ill patients, formed Sensei. This joint venture offers personalized monitoring services for wellness and disease management. Sensei operates mainly as a wireless information platform, on which subscribers will be able to receive personalized nutrition, weight loss information, fitness notifications and medication reminders through their mobile phones and/or PDA's.

donors and international foundations. And they have a limited reach, being of use for only about 100,000 people in emerging countries.⁸

Still, already today innovative, yet low-tech mobile health solutions to the most pressing problems in emerging markets exist and have been successfully piloted in countries such as Indonesia, Brazil, Rwanda, Myanmar, Nigeria, Sudan, Uganda, Kenya or India. Examples include:

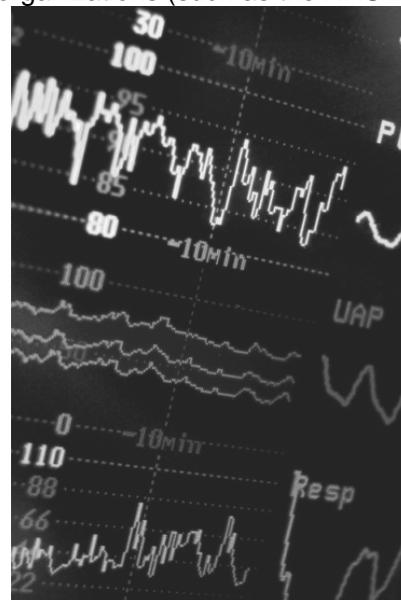
- The **Freedom HIV program**, which uses mobile phone games to educate Indian teenagers about Aids.⁹
- **EpiSurveyor** equips mobile devices used by health workers with software for simple healthcare data collection.⁹
- Telecommunication equipment provider Ericsson and mobile phone service operator Zain have teamed to provide **toll-free emergency numbers in remote African areas**. The project is piloted in Kenya but expected to be rolled out to Tanzania and Uganda.⁸
- The **“Gramjyothi” (“Light of the Village”)** brings broadband capabilities to 18 Indian villages and 15 towns, allowing them to use mobile broadband for a host of mobile health services. Ericsson works in partnership with Apollo Hospitals Group, “Hand in Hand,” a local nonprofit and others to deliver a range of offerings including telemedicine and e-education.⁹
- The **“Anganwadi” project** allows social workers in rural areas of India, who are monitoring children to easily enter, evaluate and easily transmit health data.⁹

During a 2008 conference on mobile health organized by the United Nations Foundation and the Vodafone Foundation, members noted mobile healthcare’s promise for emerging nations. Despite this promise and some progress in the sector, scaling successful initiatives onto a global level appears years away.

Healthcare policies and delivery systems differ significantly across countries, and these differences in turn impact the attractiveness of regional markets for mobile health providers.¹⁰

Private investors in mobile health must consider an array of stakeholders and needs, which vary depending on a nation’s healthcare system and structure. In the nationally controlled and funded European system, the buy-in of national healthcare government organizations (such as the NHS in the UK) is needed. However, demand always exceeds supply in such systems with a ‘free at the point of delivery’ philosophy. Government healthcare agencies end up focusing on rationing services. Without pressures from a competitive marketplace, preventative care often is a low priority since benefits are hard to quantify. As a result, mobile health services often are tougher to sell in nationalized care markets since prevention is their major feature and differentiating selling point.

In comparison, despite federal and state investments in Medicaid and Medicare, the US has taken more of a market-based attitude to healthcare. Health insurers are major influencers of healthcare management and delivery in the US. Through commercial pressures, but often in partnerships and alliances with providers, this is leading to greater innovation and application of the available technology. The US has demonstrated a greater willingness to use such technologies to aid personal management of health, particularly when such practices can be shown to reduce the rates of hospitalization.



⁸ Business Daily, Nairobi, 2008

⁹ mHealth: A Potential Tool for HealthCare Delivery in India, from the 2008 conference “making the eHealth connection”

¹⁰ See also Wireless Healthcare: Wireless Healthcare 2008

Barriers and focus areas

In theory, mobile health solutions could create win-win situations for all involved stakeholders. Governments and insurance companies benefit from reduced costs when providing health services; patients and individuals enjoy increased quality in life e.g. when avoiding hospital stays; healthcare providers can more easily deliver higher quality services; hospital staff is freed from routine cases and can focus on more critical patients; telecom companies get fairly compensated for their service provisioning and can even indirectly support their traditional core business e.g. through decreased customer churn and increased network utilization. But this winning scenario must overcome major obstacles before it's a reality. Today, mobile health services must be adapted to work with existing technology infrastructures and systems, slowly down their availability and reducing demand. To move forward, these **supply and demand barriers** must be addressed. Ironically, mobile health services don't face these obstacles in developing countries where there's little in the way of existing infrastructures to impede services roll launches.

Supply barriers

Fragmentation in technologies and healthcare processes

Mobile health solutions rarely are stand-alone applications. The value often lies in exchanging information across databases from hospitals, pharmaceutical companies, national health systems or medical specialists. Technical integration requires standardization of communication protocols and IT system architectures. However, despite efforts from groups such as the Institute of Electrical and Electronics Engineers or the Continua Health Alliance, fragmentation persists on many levels: different hospitals use different processes and technologies for service delivery; service billing needs to be integrated with government agencies, insurance companies, physicians. Such complications are even more prevalent on an international level. The required customization often results in mobile health applications which are, although successful in pilot trials, difficult to scale to the mass market.

Non-unified Electronic Patient Records

Unified patient medical records, electronic medical profiles of individuals, are a prerequisite for many mobile health applications and are demanded by many solution providers. Most attempts in the past to establish electronic storage of individual healthcare data have been unsuccessful mainly due to privacy concerns of end users and unspecified legal frameworks. So far, Electronic Patient Records have been implemented mainly within the limited scope of specific hospital groups¹¹, not across borders of different healthcare providers. Attempts to establish such standards on a national level have so far failed. For example, the German government has been developing an electronic health card to store administrative and medical patient data since 2003. Although the effort is regarded in the EU as one of the leading pilots on a national level, it has not yet materialized into a tangible solution for the mass market due to privacy concerns and exploding implementation costs. The US legislature has debated several bills to achieve similar results, such as the 2007 Personalized Health Information Act, but have none have passed.

Assurances of service quality across shared public networks

From the perspective of Telecom operators, the principle of service level assurance, the equal treatment of data packages in broadband networks, actually hinders the establishment of many healthcare services. These offerings often rely on real-time communication, e.g. when it comes to emergency routines. However, such communication is not prioritized against other data traffic; lagged response times and capacity constraints undermine the provision of such services. This undermines, for instance, the reliability and acceptance of remote patient monitoring applications in time-critical applications.

¹¹ E.g. the Hirslanden group, the leading group of private Swiss hospitals, has introduced in June 2008 the first PMI database in Switzerland

Unresolved liability questions

Technology providers and telecom operators will take on increasing levels of responsibility for the reliable and timely provision of healthcare services. However, liability in connection with medical malpractice and security issues with patient data is a major legal uncertainty. Given the complexity of mobile networks and a borderless Internet, it can be difficult to determine where transactions occurred, which laws apply and which courts have jurisdiction. Existing laws such as the EU's Data Protection Directive do not fully address the regulatory issues raised by mobile healthcare. Policy makers in the US and the EU understand both at the national and regional levels that these unanswered legal issues impact mobile health growth, but so far they've made little progress resolving them.

Demand barriers

Uncertain remuneration of private sector investments

Significant up-front investments are required to develop mobile health services for the mass market, including network upgrades and expansions, development of customized devices and infrastructure to manage service delivery and billing. The private sector will only make these investments if businesses are convinced that they'll see strong financial returns. However, there is no single "owner" of health markets who could sponsor such investments: decision makers can either be found within governments or insurance companies, depending on health sector structures.



However, to date, costs associated with mobile health services have rarely been covered by national reimbursement schemes. This is partly due to the preventive character of mobile health services with hard-to-quantify benefits.

Security and privacy concerns

The potential to misuse personal medical information is a serious concern. Possibilities include using medical records to screen health insurance applicants, hiring employees, or to restrict immigration. Increased electronic and mobile capture and dispersion of individual healthcare data is counter-intuitive for many prospective users as several past activities demonstrate. For example, US medical providers are required to protect medical records under the Health Insurance Portability and Accountability Act (HIPAA).¹² Everyone in the industry—doctors, pharmacies, researchers, administrators—must abide by HIPAA. This law dictates how medical professionals can disclose patient-related information. However, when patient data is collected remotely, transmitted via cellular networks, electronically stored and analyzed by various parties, it is much more difficult for any player to ensure that information is not accessed inappropriately.

Focus areas to reducing and eliminating market barriers

Participants in the mobile health market can take several actions to overcome these barriers.

Recognize that large scale public sector or multi-country initiatives will take time to break down barriers. In the mid-term, continue to invest in solutions at national level, particularly where markets are inherently attractive or where an opportunity to proactively shape the national environment exists.

¹² See also IDC: Strong Brand for Search: Will it help or hurt Google Health? (2008)

Public parties are working hard to resolve the stated supply- and demand-side barriers. One example: the UK National Health Services is currently heavily investing into core infrastructure applications such as Electronic Patient Records. However, the size and complexity of such top-down approaches and the number of involved stakeholders make it unlikely that tangible applications and results will materialize in the short term.

Instead, private investors are required to follow a bottom-up approach and to leverage project successes to support the emergence of more favorable market environments. Mobile health segments such as the remote monitoring of diabetics or patients with chronic heart diseases combine two crucial ingredients—high market demand and a relatively uncomplicated roll out. Required data such as blood sugar levels is relatively easy to capture and can be reliably interpreted by medical specialists. Investments in such segments are likely to create positive financial returns. But more importantly for the overall development of national markets, these pilot applications can be leveraged to stimulate demand for more complex mobile health solutions, to develop required technology and information standards and to demonstrate tangible benefits to governments and insurance companies to overcome financing barriers.

Work with partners to deliver interoperability and standardization of technology and information

All healthcare providers need to adopt common technology and information standards—both on a national and international level. Without key standards like Electronic Patient Records, mobile health services will remain niche offerings without the mass-market acceptance needed for economic feasibility.

Several private sector initiatives already are in place to standardize devices, communication protocols and IT systems. For example, the Continua Health Alliance, a US-based group of 38 technology companies and healthcare providers¹³, is defining and promoting mobile technology standards through a product certification logo program.

To realize scale economics in mobile health applications, standardization efforts need to be additionally expanded beyond the technology and communication layer to include healthcare processes, organizational blueprints for healthcare providers or insurance code schemes for mobile health services on a national level. Achieving this increased interoperability in healthcare processes on all levels is already on the agenda of many industrialized health markets. In the US, it is part of a major initiative by the Nationwide Health Information Network (NHIN), led by the US Department of Health and Human Services.

Leverage project successes to stimulate demand for more complex mobile health solutions

Most patients and healthcare providers aren't aware of mobile health's benefits.¹⁴ One way to overcome this lack of awareness is to build off the loyalty of consumers and providers who already are sold on mobile health services like remote patient monitoring. Target new products at this group of users—they will be more open to incorporating additional mobile offerings into their daily routines.

Demonstrate (on the basis of successful initiatives) the business case and economic benefits to providers and governments to ensure mobile health services are included in financial reimbursement schemes

Ultimately, telecoms will need to see substantial financial returns to justify their investments in mass market for mobile health services. As noted above, in health markets centrally financed by governments and/or insurances, such as large parts of Europe, clearance and pricing of mobile health services by central agencies is required. This is not trivial, as a fair service pricing would include all benefits for patients and healthcare providers generated by the service. However, agencies have so far only taken direct cost reduction effects into account, often resulting in unfavorable economic scenarios for mobile health providers.

¹³ As of end 2008

¹⁴ See for example Wireless Healthcare: Wireless Healthcare 2008

Private investors are required to demonstrate through real-life solutions the related economical and service quality benefits to make sure mobile health services are integrated into national health finance schemes in order to avoid being restricted to self-paying consumers. Opportunities to co-finance up-front investments with public parties should be explored. For example, the EU considers a broader financial support for the development of mobile health solutions¹⁵ in cooperation with private investors.

Pro-actively support the definition of legal liability frameworks to stimulate consumer demand

New laws and regulations are needed to resolve liability issues over the mobile distribution of medical data and storage, nationally and internationally. Existing laws cover some aspects of mobile health security and privacy, like the European Community's general product liability directives and its competition law.

Much broader initiatives are required to address issues unique to mobile health—one example is the European Commission's work in this area.¹⁶ Telecom and healthcare providers should be proactive and help draft legal guidelines that clearly spell out the legal responsibilities of all service providers. By adopting laws and regulations that establish legal responsibility, it will help overcome consumer concerns about the security and privacy of healthcare data.

Conclusion

Mobile health offers a huge opportunity for all the stakeholders: Telecoms, Technology and Healthcare providers, governments and consumers. However, the market still is in its infancy. To spur growth, multi supply and demand barriers need to be addressed. Roadmaps for developing mobile health markets will vary dramatically across nations and healthcare systems. But all successful expansions require collaboration between private investors and governments on an array of issues. Top-down, centralized initiatives by public parties need to be complemented by bottom-up approaches of the Telecom and Healthcare industries. Narrowly scoped solutions, such as remote patient monitoring, could be leveraged to push technology and information interoperability, stimulate demand and clarify legal uncertainties.

¹⁵ E.g. European Union, Aho Report: Effectiveness of Information Society Research in the EU's 6th Framework Programme 2003-2006

¹⁶ European Commission: Information Society and Media – Putting ehealth in its European legal context (March 2008)

Cross-Industry Collaboration: Mobile Information and Entertainment Services

Executive summary

Leading participants in the telecommunications, technology and media industries are facing an interesting challenge: how do they replicate the mass-market adoption of media services, products and content on the wired Internet while avoiding some of its potential downsides like unequally distributed profits, piracy, viruses, and loss of control of the consumer and brand experience.

All Mobile Internet companies have a strong interest in increasing consumption of mobile content. Each player has a different goal. At a minimum, operators hope to generate revenue from traffic associated with these data-intensive services to counter the slowdown in the growth of average revenue per user (ARPU) for voice and data. **Device manufacturers** hope demand for easier-to-use phones with more features will increase premium handset sales and accelerate the pace at which consumers are replacing their existing devices. Both device makers and operators are exploring ways to capture revenue from Mobile Internet content and services. **Content owners**, while wary of trading “analog dollars for digital pennies,” as one industry CEO put it, know that they need to respond to consumer demand for access to content at any time and in any setting. They are further intrigued by the possibility of reaching their customers directly. Finally, many leading **Internet companies** with roots in the “wired” Internet space—from software vendors to major aggregators—see cell phones reaching three times the penetration of personal computers. They believe that the future of the Internet increasingly is mobile.

Even though so many powerful media, technology and telecommunications companies have a shared interest in spurring mobile content growth, the **results, to date, are limited. The barriers are well known and multifaceted.** They are largely caused by three major underlying issues:



- Low-quality viewing experience for rich media such as streaming video—the result of still-developing technology, slow network speeds, poor user interfaces, short battery life and a lack of readily available media-enabled devices.
- Lack of clear business models for operators and content owners, often resulting in high cost of content and consumer confusion over where to find, how to use and how to pay for desired content
- Poor marketing execution—one of the reasons consumers haven't used technology or capabilities that are available to them is they often don't understand all the features or capabilities.

And yet, there is a **mood of optimism in this space, stemming from the belief that we are at an inflection point for mass-market adoption of mobile content.** This belief is based on some encouraging signs:

- Recent breakthroughs in delivering a higher quality, easier-to-use interface and experience, such as Apple's iPhone, have resulted in increased usage of Mobile Internet content and services;
- The continued roll out of higher speed networks and the release of mobile handsets with more capabilities, have addressed some of the quality issues for viewing rich media;
- A greater focus by operators on targeted consumer education and marketing plans aimed at encouraging both trial and repeat purchase
- A new trend toward a less fragmented mobile content ecosystem. Many companies are adopting a more “open” approach. This is encouraging more participation from the developer, business and investor communities.

One company, Apple Inc., has won tremendous media attention for its sleek hardware and intuitive user interface, innovations that have triggered increased consumer demand for mobile content. However it is arguably another trend that is having an even more profound impact on reshaping the industry: a more coordinated and open approach. We are talking about more than the traditional “walled garden” debate over restricting user access to Web content and services. More openness involves creating an environment that encourages participation by more participants at several levels: the increased use of open source code for operating systems, greater availability of free software developer kits so that third parties can write media applications, and more flexibility by operators in how they structure partnerships with device manufacturers and content owners. Together, these trends are helping to lower the cost and time it takes to get applications to market. It also is allowing the many companies involved in the industry to share the benefits from the increasing use of mobile content and services.

However, the move toward reducing complexity and “opening” the mobile content ecosystem is advancing at a slow pace. This is due, in part, to the many different standards, networks and operating systems. But it can also be attributed to Mobile Internet participants who, taking a lesson from wired Internet companies, are deliberately pursuing different strategies. For example, many industry participants are attempting to build business models that **they believe will better control the quality of the user experience, ensure a more balanced distribution of returns for all participants in the system, deter piracy and prevent their services from becoming commodities.**

To encourage faster adoption of mobile media in the short term, telecommunication companies, information technology (IT) and content providers should:

- **Pick their spots**—Where do they add the most value? Which activities are too important—now or in the future—to relinquish to others? And, depending on what a partner is offering, what’s negotiable?
- **Actively work with partners to design a scalable, integrated model that will encourage mass-market adoption of services.** While most companies in the mobile industry are wary of duplicating problems that they’ve observed in the wired Internet market, they must work toward a more standardized environment. This approach reduces development costs enough for application providers to reach large-scale audiences.
- **Develop a sophisticated understanding of their customer base, using data to segment offerings** and target marketing campaigns.
- **Experiment more aggressively with new business and revenue-sharing models** in order to crack the problem of how to generate profits from mobile media usage.



In the course of this paper, we address these issues in more detail. Our goal is to provide all participants with a concise overview of the current situation before discussing the critical questions during the session in New York.

A shared interest in promoting faster adoption of entertainment content on the Mobile Internet

Companies across the industry want to find ways to increase consumer use of Mobile Internet content, though each has different goals and needs:

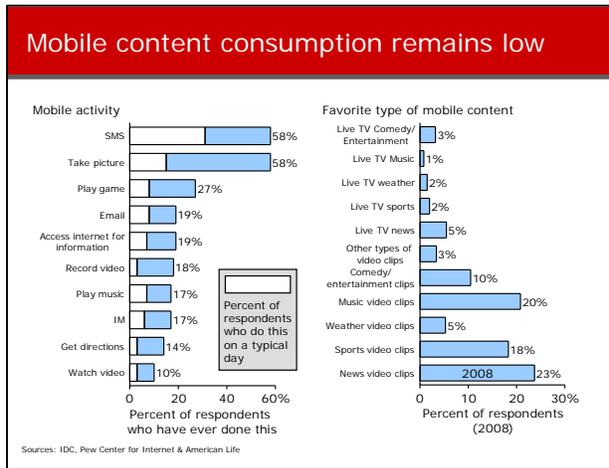
- **Operators:** As mobile handset penetration increases, incremental revenue growth from new subscribers will slow significantly and operators will feel increasing pressure to lower prices due to a number of new applications, such as Voice over Internet Protocol (VoIP), Virtual Private Networks (VPNs) and hosted applications. The Mobile Internet could represent the next wave of growth for operators—provided that they can develop a sustainable business model that provides strong revenue and not just more traffic.
- **Device manufacturers:** As ODMs continue to gain share at the low end of the market, manufacturers are eager to spur demand for more expensive smartphones and mid-tier phones with more complex features. Device manufacturers remain concerned about margin pressure across their product lines.¹ Following a well-established path in other technology industry sectors, device manufacturers view mobile content services as a key opportunity to drive top and bottom line growth. While this has been a long-standing goal for many device makers, the move towards openness across the industry creates more opportunity for progress.
- **Content owners:** Media conglomerates that own valuable brands want to demonstrate to shareholders and advertisers that they are capable of reaching coveted consumer segments on any medium or technology platform. But mobile content distribution still is in the early, experimental stages, as content owners explore revenue models and await the market size and data resources necessary to monetize usage. Investors remain worried about the growing threat online content poses to traditional media. To date, they have given media conglomerates little credit for exploring the potential of this third vehicle—the “third screen”—for delivering more advertising, with potentially more targeted advertising messages. Stand alone mobile content start ups, however, have benefited from considerable investor interest.
- **Aggregators:** With mobile phone penetration now three times that of desktop computers and growing even more rapidly, many of the largest online participants in the wired Internet world view the Mobile Internet as the next frontier. They are moving quickly to build scale, including in the critical area of user data.
- **Consumers:** The emergence of an increasingly mobile-oriented lifestyle has raised consumer expectations. They want to be able to access desired content—whether for work or for leisure—whenever and wherever they are. But as mobility becomes more pervasive, it is unclear whether consumers will move away from an all-in-one mobile device in favor of highly specialized devices for specific uses, such as Amazon’s Kindle for reading books. The emerging possibility of storing content, preferences, and other information in third-party servers makes this a very real possibility.



¹ Source: Bain analysis, Deutsche Bank 24 nov 2006 "Handset industry strategy" Leveraging structural changes

A complex set of barriers have long slowed adoption

Serious **technical constraints** continue to inhibit consumers' access to high-quality entertainment over the Mobile Internet. Complex user interfaces, limited battery life, small screen size, slow network speeds and hard-to-use devices are the most commonly cited barriers.



However, many observers feel that these are secondary to the **obstacles for creating business models** for mobile content. The primary hurdle being the **enormous complexity and fragmentation of the mobile content ecosystem**: the sheer number of devices, networks and operators with different technical requirements translates into high costs for application developers. Developers must adapt offerings for countless numbers of different devices and networks. As a result, developers have a hard time gaining a mass market foothold, while consumers struggle with uneven quality.

The companies' resistance to simplification and standardization stems from both offensive and defensive strategies. Understandably, they want to maintain their differentiation from competitors, with hopes of growing their share or increasing their market influence. They also are wary of letting other companies establish a *de facto* standard where a few participants have disproportionate power over the marketplace. But this pursuit of different strategies makes it harder for consumers to purchase mobile content and applications. For consumers, the process of trying to sort through so many mobile options is both time-consuming and confusing.

Meanwhile, companies have underinvested in the marketing and consumer education required to help consumers understand complex products. As device features have sky-rocketed, user manuals have grown thicker and harder to follow, deterring new consumers from fully exploring the range of available content and services. Many users remain unaware of media features they can access over the Mobile Internet. Others are aware of offerings, but uncertain about both how to access them, and what they will be charged if they do.

Price can be a barrier, especially for the teen and "tween" segments. Some analysts predict that the rise of an advertising-based business model will spur usage in some mobile content segments. **However, the majority of industry observers believe that we are at least three-to-five years away from a viable mobile advertising model for content.** In the meantime, there are numerous barriers—involving technology, regulation and consumers—that must be overcome.

Together, these difficulties create a less-than-optimal experience for consumers, a fact that is confirmed by various studies on patterns of use. One study released in February 2008 dramatically underscores this point. It's based on a statistical analysis of key issues encountered by 11 million customers using five mobile operator systems in the last quarter of 2007.

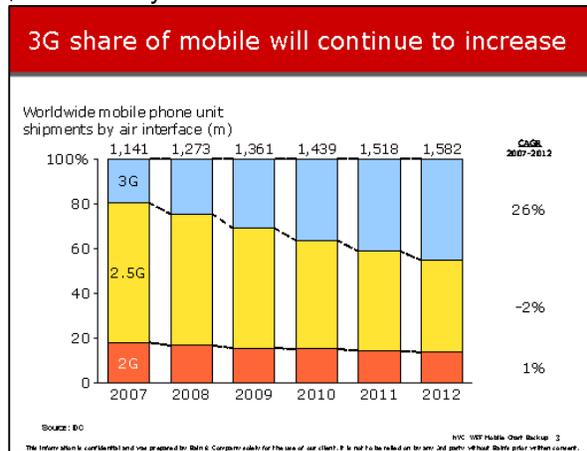
- 85 percent of mobile TV viewers abandoned the service after just one viewing;
- More than 70 percent of those who subscribe to content packages don't consume any content;
- More than 50 percent of all product or service downloads are not successfully completed;²
- Fewer than 20 percent of American consumers with Mobile Internet have ever used it to access content³

² Olisto study of Q4 2007 European mobile operators

³ IDC, Pew Center for Internet and American Life

Recent trends offer some encouragement

Recent events have encouraged optimism about accelerated growth in the mobile content segment. Forecasts continue to be robust—worldwide spending is expected to reach more than \$41 billion by 2011.⁴



First, the **number of mobile users covered by 3G networks and owning high-end phones continues to increase.** While Japan leads the world market—80 percent of Japanese mobile phone users have access to 3G services—South Korean 3G penetration already exceeds 75 percent. Europe, the US and Canada lag behind with 3G users, nearing the 30 percent mark. The introduction of 3G wireless to India's 300 million mobile customers could trigger a boom in subscribers.⁵ In addition, we see increased evidence that consumers are using “mid-tier” phones with some media features for Internet surfing and entertainment. For example,

nearly half of the mobile ads distributed by AdMob were delivered to “feature” phones rather than smart phones,⁶ indicating growing consumer demand for mobile content across many customer segments and potential for quick growth in emerging markets.

Second, mobile **operators and governments are increasingly sophisticated in encouraging adoption and use of advanced services.** For example, in the successful Japanese mobile content market, operators deliver a better experience through pricing and cooperative relationships with other industry participants, ensuring ease and quality of use by consumers. Government policies that favored a low-cost spectrum for increased competition led to improved service quality, value and, as a result, consumer adoption.

Third, several operators have demonstrated that there are **non-price levers that can be pulled to drive both trial and usage.** A high quality user experience is paramount—successful mobile content markets begin with the highest speeds, followed through with optimal education and marketing support to build consumer awareness and understanding. Operators in top markets have worked to make the experience highly relevant to users by applying detailed customer insights to service design, offering enhanced product bundling and leveraging location-based service to deliver marketing messages.

Telstra's success in the Australian market is illustrative of this trend. The company made a number of investments to drive increased mobile content and services usage. They invested in **fast, nationwide 3G network** upgrade to ensure high-quality delivery and negotiated **differentiated content offerings** (e.g., exclusive sports offerings) with key partners. However they didn't just rely on a “product push” strategy. Instead they also radically redesigned the **in store customer experience** based on primary research with consumers and small business users. The resulting T[life] stores place more emphasis on personal selling, including **one-on-one demonstrations of how to navigate and select media offerings.** This required providing the staff with 50 percent more training (4 additional weeks), but has also generated conversion rates that are 50 percent higher than Telstra's traditional retail stores. Once they've got customers trying mobile entertainment services, Telstra also employs **data mining techniques to better understand customer usage patterns** and then uses this data to **develop specific direct marketing campaigns** to encourage people to try related services that they're likely to enjoy. The results of

⁴ IDC (12/07) , Juniper Research (01/08) – excludes adult content and mobile gambling

⁵ GigaOm (04/08)

⁶ “The Mobile Web: It's Not Just for Smartphones” New York Times July 17, 2008

these aligned investments are beginning to impact key metrics. ARPU per customer in the Sydney T[Life] store is about 40 percent higher than its traditional stores. Overall, Telstra has seen total mobile services revenues grow 12 percent in the latest financial year including 33 percent growth in non-SMS mobile handset data revenue (e.g., MMS, browsing, content and email).

Fourth, and perhaps most dramatic, the recent success of simple, intuitive interfaces reflects the importance of ease-of-use. **An improved user interface can generate a huge increase in media consumption over the Mobile Internet.** The news is filled with examples. The ones we've included below illustrate the marked difference in media content and services by consumers taking advantage of sophisticated user interfaces, a group that includes early adopters who are heavy users:

- Several months after Apple and AT&T launched the first iPhone, Google reported that iPhone users generated 50 times the normal volume of searches;
- In Japan, DOCOMO converted 42 percent of its content subscribers to premium services through its easy-to-use iChannel phone and service;⁷
- In the US, smartphone users with top-quality Internet browsing capabilities represented nearly 4.5 times more Internet use than average phone users.⁸

Finally, there is strong evidence that consumer adoption of mobile media and entertainment content will be even steeper in emerging markets. Wired broadband connections are expensive, limited in availability, or both, which means that many consumers in emerging markets rely on their mobile phones for Internet access. The numbers bear that out: more than 11 percent of Russian mobile users accessed the Internet from a mobile device, trailing only the United States, the United Kingdom and Italy in terms of consumers trying the Mobile Internet. The rates are similar in China where the Mobile Internet penetration rate is nearing 7 percent—close to the level in Germany. And in the key emerging markets—the BRIC countries of Brazil, Russia, India and China—entertainment-themed websites are already the most popular with mobile users. In contrast, US and Western European consumers favor news and information sites, opting to view entertainment content like movies and TV shows over their PCs and televisions.⁹

As services evolve, all the industry participants need to share a common goal: making the Mobile Internet more responsive and relevant to consumers. For example, preliminary results from location-based marketing services show they hold promise, by influencing consumer preferences and offering consumers assistance while they're making purchases.

It is, however, important to place these encouraging signs within the context of what continues to be a long struggle to drive both uptake and monetization. In many markets, companies use mobile entertainment options as a way to differentiate with consumers, not as a revenue producer. Even the most advanced markets, such as South Korea and Japan, are finding it challenging to generate revenue from sophisticated mobile content services such as video. Part of the difficulty is that wired broadband has trained consumers to view ad-supported content as “free.” This model hasn't yet proven viable for mobile content.

⁷ IDC, February 2007

⁸ M:Metrics, March 2008

⁹ Nielsen, Mobile Media Marketplace Report, Q1 2008



A Trend Toward Openness: A Way To Reduce Complexity?

One of the fundamental differences between the wired and Mobile Internet is that the wired Internet's technology and systems are more standardized, allowing most applications to work regardless of the hardware or service provider. By contrast, the evolution of the mobile industry, with varying national and regional standards, has resulted in a very different structure with a fragmented set of device and infrastructure standards.

In addition, mobile industry companies have learned from the wired Internet. As they develop business models and form alliances, some participants want to avoid replicating some of the wired Internet's less-desirable aspects, including **the presence of powerful gatekeepers, minimal compensation for general data traffic**, services that have become commodities, piracy, **and a need for improved consumer protection in some areas related to** identity theft and viruses. As a result, Mobile Internet companies took steps to ensure a higher quality user experience for their customers and a more controlled revenue strategy for themselves by adopting a cautious “walled garden” approach which attempted to control user access to Web content and services. But as consumers demanded greater choice, many of these walled gardens have disappeared or evolved to a more subtle “steering” the customer toward preferred content and partners through the user interface, menu design and pricing.

While the Mobile Internet remains more complex than its wired counterpart, with many more gatekeepers, we are seeing a significant shift toward more integration and openness by companies across the industry, especially over the past year. While this new spirit is at an early stage, there are several examples:

- The trend toward using **open source code as a key part of the mobile operating system**. That includes Android, LiMo and most recently the transition of dominant smart phone operating system maker, Symbian, to open source. Nokia acquired the remaining piece of Symbian that it didn't own, then turned Symbian's operating system into a foundation for an open-source licensing model, a move that allows Nokia—and Symbian—

to capitalize on two key industry shifts. First, Nokia brings Symbian-savvy engineers in house, where they can focus on enhancing the user interface and features on Nokia phones. Second, turning Symbian's operating system into an open source model will attract more developers to the Symbian platform, allowing the company to remain a player as Google and Apple make inroads.

- Even Apple is showing more openness. The company's OSX operating system, more of a **proprietary model, has increased openness by offering software developer kits** with key elements of the code for third-party developers. These kits allow developers to create applications for more products and services. The SDK kit was downloaded 250,000 times in the three months following its launch.¹⁰ When Google unveiled Android, an open source mobile phone operating system, and released its SDK a month later, downloads reportedly totaled 750,000 in the first four months alone.¹¹
- Telecom operators are also making other changes to facilitate the development and deployment of new applications. Many operators – AT&T, KPN, Vodafone – are **building platforms based on service-oriented architecture just above the IMS (IP Multimedia Subsystems) level**. Beyond the technical detail, this essentially allows for more “plug and play” media services at the network level, **cutting development time and costs for new services by as much as 90 percent**, according to some industry analysts.¹²
- We are increasingly seeing **technologies converge around fewer poles for standards**, such as LTE (and WIMAX) for 4G technology thereby increasing compatibility.
- There also is a move toward **“alliances” with broad-based membership**, such as the Google-led Open Handset Alliance and the recently announced BOND initiative. These alliances allow leading mobile operators to collaborate on a uniform way to expose key handset features to help Web developers create more mobile-friendly applications.
- **Markets that have given telecom operators tight control over the devices that could run on their networks are opening as well**. The US is a prime example. The recent FCC spectrum auction included a provision for open access on one of the blocks, and the two largest operators, Verizon and AT&T both announced recent policy changes that would open up their networks.
- **In every region, the trend is toward more and more content consumption occurring “off-deck”, or beyond the walled garden**. In 2007, more than 70 percent of Japan's NTT DOCOMO data traffic came from “unofficial” sites. The percentage is similar in most of Western Europe. North America has been the most flagrant hold out to this trend, with 70–80 percent of mobile content being delivered through operator-controlled channels.¹³ But recent data show that the dominance of operator-run walled gardens in the content landscape is diminishing. That is partly due to the rise of walled garden models controlled by device companies—Apple's App Store and Nokia's Ovi or Comes With Music are examples. The more companies involved, less control for any one gatekeeper.

In combination, these trends have created an environment that is more favorable to developers. It is faster and easier to create applications using open source operating systems and software developer kits, and converging standards mean less time and money is required to “port” content from one mobile device and/or network to another. More off deck consumption means less dependence on gatekeepers. Greater availability of mobile content that users want leads to more consumers and the potential for profitability, which, in turn, encourages the creation of more mobile content applications. This cycle has kicked in and the investors have noticed. **Venture capital investments in mobile consumer applications are up 90 percent in the first quarter of 2008 over the first half of 2007.**¹⁴

The Mobile Internet will not necessarily replicate the structure of the wired Internet. The industry participants have the opportunity to build on the lessons from the wired Internet—both its strengths and weaknesses. Also, consumers use the Mobile Internet very differently than the wired

¹⁰ Apple, 6/9/08

¹¹ VentureBeat, 3/13/08

¹² “Disruptive wireless market drivers, trends and catalysts” Deutsche Bank March 2008

¹³ “Understanding the Mobile Ecosystem”, Strategy Analytics, 2008

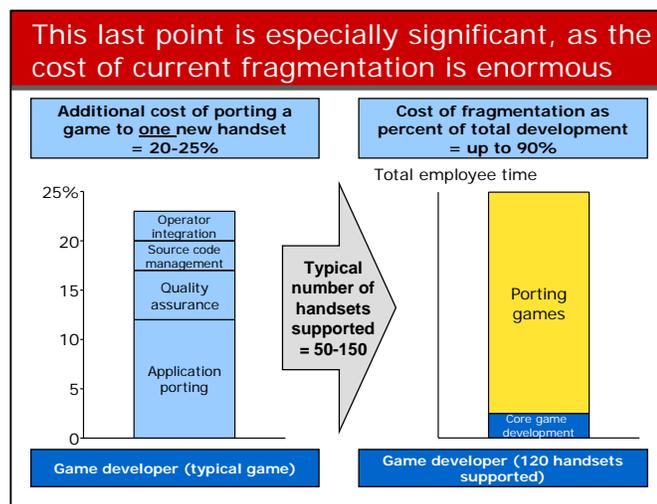
¹⁴ “Cell Phone Carriers Relax Grip on Content,” New York Times, August 4, 2008.

Internet: It is often used outside instead of inside, in time-critical or constrained situations, with smaller portable devices, and with more sensitivity to information and services based on a consumer's location. These characteristics of the Mobile Internet should be taken into account when designing Mobile Internet applications and business models.

Despite these differences, **several market pressures are pushing the Mobile Internet to more closely resemble the fixed one:**

- **“Mobilization” of traditional laptops and specialized devices** such as Amazon’s Kindle for Mobile Internet users. Telecom operators do not have as much influence over these devices as they do over mobile handsets.
- **Increasing options for downloading content through “sideloading.”** This includes using a USB cable, memory card, Bluetooth, WiFi, which undermines a provider’s ability to control access to websites and services. On US handsets, 28 percent of video and 48 percent of music consumed already comes from sideloading content.¹⁵ And more and more devices will come equipped with features that make sideloading easy: 45 percent of phones shipped globally currently have slots for memory cards, up from 2 percent in 2003, and that number is expected to almost double to more than 75 percent by 2010.¹⁶
- **Continued consumer “experimentation”** in breaking through existing barriers between wired and Mobile Internet, like the ability to “unlock” Apple’s iPhone and its proprietary services and let users make their own choices.¹⁷
- Growing efforts to develop viable **mobile advertising models**. Although they still are in their infancy and face many challenges, adopting mobile models financed by advertisers will replicate a model that’s typically used on the wired Internet.
- Efforts by some **telecom operators to differentiate themselves by adopting a more open approach** to both devices and business models such as the announcement by the Sprint/Clearwire WiMax network in the US.

Companies in the mobile space are caught between two conflicting goals. On the one hand, they want to create a viable economic model and preserves strong customer relationships. This objective pushes them to create a **tightly integrated user experience across hardware, software and content**—think Apple’s original iTunes/iPod model. This also allows them to control the operating environment in terms of network quality and billing relationships. In addition, it positions them to be able to capture and process data for still-emerging advertising options. On the other hand, they **need to drive mass-market adoption. Under most scenarios, that will require devices and services that easily work together, despite the brand or operator. The move toward interoperability and standardization**



¹⁵ ABI Research, Parks Associates (2008)

¹⁶ Strategy Analytics, op cit

¹⁷ Even For example, even in the case of Apple, 250,000 of the iPhones sold between May and September last year were never officially activated via Apple’s iTunes site (CNET, 10/23/07). The common assumption is that most of those phones were “hacked” or reconfigured to work on other networks. It took less than 24 hours after launch of the 3G version of the iPhone for the tech blogs to report that it too had been hacked by savvy users. (ITProPortal 7/15/08)

could, in turn, make it harder for operators to profit from increased consumer use.

In order to create a mass market for mobile content, all the industry participants need to take urgent action. They must work to reduce the highly fragmented marketplace and move toward standardization. The current model of individually “porting” content to each type of mobile phone is prohibitively expensive and time-consuming. Industry observers expect to see increasing openness. In the short term, a more open environment will likely accelerate development of new services and applications, as well as foster more experimentation with business models and partnerships across the entire mobile content value chain.

Key questions going forward

Is the current proliferation of operating systems and platforms sustainable? Will the open-source model and greater interoperability allow them to co-exist? Or will we see consolidation, reducing the number to perhaps just three or four, or even a “winner-take-all” scenario? If it is the latter, then which of the existing platforms are likely winners, and what are the implications for device manufacturers and operators?

Will the “all-in-one” device model persist? Or will we see increased penetration of specialized devices as cloud-based services make it easier to access their preferences, data and content? At what point do consumers rebel against having to carry multiple devices?

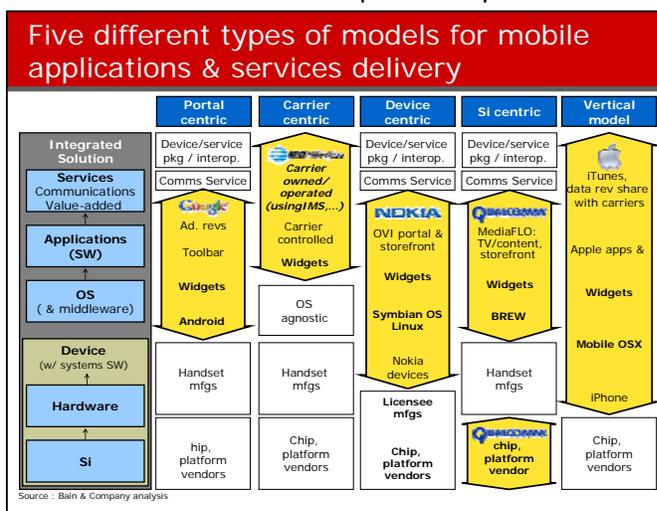
What will drive consumer choice? What will be the basis for market segments?

- Quality of content?
- Quality of interface?
- Security?
- Price?

How quickly will an advertising-based model for mobile entertainment be viable? Once mobile advertising reaches critical mass, who will control the relationship with advertisers—the carriers? Content owners? Third-party intermediaries? How will revenue be shared among them? **Another related question: what does mobile advertising allow in the way of subsidies for devices, services and applications?** The rise of an ad-supported model is expected to increase adoption of mobile entertainment by specific demographics. Some consumer segments, like teens and young adults, will have a high value for advertisers because they’re harder to reach with more traditional advertising.

Given that no one company can hope to control a mobile entertainment offerings for consumers from end to end, how will partnering strategies evolve?

- One or two exclusive partnerships for each element of the offering? A broad array of partnerships to provide customers with maximum choice? A sweet spot in between?
- How will revenue be shared?
- Who can access the data on what customers are choosing?



How will industry participants work together to educate consumers about mobile entertainment and spur adoption? For any company that wants to become an aggregator of mobile content—operators, device manufacturers or content owners, how do you motivate consumers to choose your offerings, instead of simply making it difficult to

access other content? Potential options include: focusing on the quality or exclusivity of the content or service, ensuring that your content or service is easy to find by—or perhaps pushed to—your target audience and creating a network effect—like social networks and interactive gaming—that allow you to build mobile communities and motivate user adoption.

The Social Impact of Mobile Internet

As the global adoption of mobile communications services continues to grow at unprecedented rates, there is widespread acknowledgement of the value created by connecting individuals to the global networked economy. As mobile device and network coverage increases, baseline voice and data services are evolving to include advanced Value Added Services (VAS), which utilize the resources of the public Internet.

These **Mobile Internet**¹ services have been long hailed as transformational in their ability to deliver social benefits both in industrialized and emerging countries. There is plenty of anecdotal evidence that applications such as mobile healthcare and mobile banking deliver a positive impact on people's lives.

But the potential and the evolution of the Mobile Internet still is unclear. Internet adoption rates worldwide are just starting to reach a critical mass; business models and cost structures for advanced services remain far from certain. As a result, public and private market participants have many questions about the Mobile Internet's tangible social benefits, in particular:

1. Is there a demonstrable link between Mobile Internet use and key macro economic indicators?
2. Are there specific social and/or economic benefits of Mobile Internet applications, notably in the healthcare or financial spaces?
3. Can an individual countries' readiness to embrace Mobile Internet products and services be measured using a standardized tool?

In 2008, the World Economic Forum began an initiative to address these questions with the long-term objective to support dialogue between private and public companies by **collecting, aggregating and interpreting data on the adoption of Mobile Internet value added services and their social impact**. The first phase of this work, concluding with the 2009 World Economic Forum Annual Meeting, has focused on the **evaluation of current research**.²

Analysis of this literature review suggests there currently is **no standardized tool** to help market participants address these questions. Existing research has focused on the wired Internet, wireless devices and basic mobile data services such as messaging.³ The **rare findings on the adoption of Mobile Internet-based value added services** and their impact are **fragmented** in terms of their functional and regional scope.

The need for further research that moves beyond the traditional focus on technology and basic data services penetration is evident. There appears to be an emerging consensus that developing some sort of Mobile Internet Readiness Index, either as a subset of the Forum's existing Network Readiness Index, or using it as a stand-alone model would be useful to all market participants. We have identified 15 potential variables to take into consideration for such an index—however all need more extensive testing. Measuring the social impact of Mobile Internet will require context-sensitive frameworks.

The **second phase of this initiative** will build upon these findings and work to establish a concrete methodology for measuring the impact of Mobile Internet value added services.⁴ One

¹ For the purpose of this discussion, we define Mobile Internet as the access to information stored in the public Internet or in proprietary portals via a cellular device, primarily smartphones but also e.g. including laptops with data cards.

² Based on the analysis of 42 globally published academic papers; for a full list of the examined reports please refer to the appendix.

³ Examples include "*The E-Readiness Index*" by The Economist, "*The Connectivity Scorecard* (Waverman et al.)", or research by the International Telecommunication Union.

⁴ With guidance and input from the Governors of the World Economic Forum's Telecom Industry Partners

option would be to incorporate this methodology into the Forum's existing Global Information Technology Report.

Growth drivers of fixed Internet and mobile telephony are widely examined

Research on both wired Internet and wireless telephony provide an in-depth analysis of two key issues: factors influencing how an economy adopts these technologies and, to a lesser degree, which social benefits are linked to the wired and Mobile Internet as well as related services.

This body of research has identified the economic factors that most impact growth of wired and Mobile Internet services. Studies include:

- *Is there a global digital divide for digital wireless phone technologies?* (Kauffman and Techatassanasoontorn)
- *Global connectivity through wireless network technology* (Kamssu)
- *Policy reform, economic growth and the digital divide* (Dasgupta, Lall, Wheeler)
- *E-readiness ranking* (Economist) and *Universal access: how mobile can bring communication to all* (GSM Association)

These growth factors are clustered in three groups:

- **Economic environment**
 - Gross Domestic Product/correlation to purchasing-power parity;
 - Average income per capita;
 - Relative price levels;
 - Level of infrastructure investments;
 - Mobile coverage;
 - Regional pricing differences/impact on investment requirements
- **Political environment**
 - Political stability;
 - Effective governance;
 - Level of education;
 - Competition policies;
 - Level of corruption
- **Socio-cultural environment**
 - Level of education;
 - Extent of social networking

Studies also have examined the social impact of wired Internet and wireless telephony adoption. These include:

- *The \$500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access.* (Crandall and Jackson)"
- *Measuring the Economic Impact of Broadband Deployment* (Gillet)
- *The Connectivity Scorecard* (Waverman, et al)
- *Impact of Broadband Adoption in Rural New Brunswick* (Selouani and Hamam).

Research in this field focuses on the qualitative benefits for users such as faster access to more information, easier communication and intensified social networking. A few studies have attempted to measure the social impact with specific, quantified key performance indicators. These KPIs are:

- **Macro-economic benefits**
 - GDP growth

- Employment growth
- Labor productivity changes
- Growth in number of businesses
- **Individual benefits**
 - Increase in individual annual income⁵
 - Increase in residential property value⁶
 - Comparisons in time/financial cost benefits⁷

Limited research on the forces behind Mobile Internet adoption and its social impact

Compared with the exhaustive analysis of mobile phone and broadband adoption and their social impact, research on the Mobile Internet is much more limited. Relevant studies include:

- *The Connectivity Scorecard* (Waverman, et al);
- *A framework for understanding Mobile Internet motivations and behaviors* (Taylor, et al);
- *Value based adoption of Mobile Internet* (Kim, Chan, Gupta);
- *Adoption of Mobile Internet services* (Pedersen);
- *Culture-technology fit* (Lee, et al).

These studies identified two types of variables that influence adoption. The first group measures the extent to which the Mobile Internet has penetrated an economy:

- Number of 3G subscribers;
- Portion of mobile data service revenues from mobile service revenues;
- Mobile e-mail composite⁸—private users;
- Mobile Internet composite—private users;
- Mobile Internet composite—business users;
- Mobile e-mail composite—business users.

The second group of variables provides an understanding of why individuals are using the Mobile Internet. Various surveys show that the following factors influence Mobile Internet use by consumer:

- User knowledge of available technology and service options;
- User interest in technology;
- Perceived price/benefit ratio of Mobile Internet services;
- Perceived usefulness of Mobile Internet services;
- Perceived ease of use;
- Perceived ability to assert cultural values such as individuality.

⁵ Individuals here are primarily survey respondents belonging to a rural/remote community that has begun to use mobile and broadband services

⁶ Gillett et al. outline an increase in property value of more than 6 percent in areas with broadband access (see 3)

⁷ Comparison of taxi cost to the call rate for those individuals who earlier had to travel long distances for interacting/dealing with business associates

⁸ Mix of (a) the proportion of users who are aware of the service (b) the proportion of users who actually use the service (c) the frequency of usage

Inevitable methodological uncertainties undermine the measurement of the social impact of Mobile Internet

Except for these studies on Mobile Internet penetration and adoption, there is little research on the broader issue of how Mobile Internet services are changing society. That lack of information probably stems from researchers' limited ability to measure the social impact. Several variables make it hard to isolate the affect of Mobile Internet services on both individuals and society.

First, Mobile Internet users also are mobile phone users. If a user's life is improved, it is often difficult to determine which technology is responsible—or if it's a combination of both.

Second, countries that heavily invest in Mobile Internet infrastructure and encourage market growth are more likely to also support other types of innovative technology. Again, it is hard to sort out what exactly affected the economic development—growing mobile phone use or general technological improvements.

Third, a lack of Mobile Internet adoption does not necessarily correlate with a less technologically advanced society—it might mean that there's a wide-reaching, well functioning wired Internet infrastructure. In some countries, the same services that are delivered via the Mobile Internet might be delivered in other ways. A prime example is mobile banking.

Fourth, Mobile Internet users in emerging countries tend to be wealthier and better educated. A person's improved welfare might result from these factors instead of Mobile Internet services. The only way to determine what influenced the change is to compare a group of mobile users with non-users.

Finally, there isn't a clear cause-effect relationship between the level of a country's Mobile Internet readiness and its economic development. Do more advanced economies increasingly embrace Mobile Internet services? Or is it the other way around, where Mobile Internet services trigger economic growth? Current research reflects both points of view—an increase in GDP is mentioned as both fueling the adoption of technology and as a result of technology use.

Despite this lack of research, existing studies provide a look at promising methodologies and key indicators that deserve more testing and research.

Research suggests a number of variables to measure Mobile Internet readiness

One respected publication, the annual Global Information Technology Report by the World Economic Forum, has identified factors that enable countries to take advantage of information and communication technology (ICT), resulting in increased growth and wealth⁹. The underlying findings are called the Network Readiness Index (NRI), developed in 2002 by the European business school, INSEAD. This methodology is based on three premises:

- **Environment is key:** An essential pre-condition for a country to benefit fully from ICT opportunities is the presence of a market, as well as a political, regulatory and infrastructure environment that is conducive to the development of ICT
- **Leveraging ICT depends on a multi-stakeholder effort:** ICT success is the result of a joint effort of multiple stakeholders: the government, business and civil society.
- **ICT readiness fosters ICT usage:** There is a strong correlation between the degree of preparedness and propensity to use ICT of the three above stakeholders and their actual ICT usage.

⁹ See for example the latest publication of: Soumitra Dutta and Irene Mia: The Global Information Technology Report 2007-2008

The Network Readiness Index (NRI) is made up of 68 variables grouped into nine categories.

- **Usage**
 - Individual
 - Business
 - Government

- **Environment**
 - Market
 - Political and regulatory
 - Infrastructure

- **Readiness**
 - Individual
 - Business
 - Government

While the Mobile Internet is included, this index doesn't look specifically at the extent to which countries have adopted Mobile Internet services and the enabling factors. Other research, such as the *The Connectivity Scorecard* (Waverman, et al) includes a more extensive analysis of variables that contribute to Mobile Internet growth.

These findings of the first phase suggest that the following 15 variables would provide a richer picture of Mobile Internet value added service adoption.¹⁰

- **Usage**
 - Number of 3G network subscribers as a percentage of total population (or percent of smartphone sales in a given period of time out of total population);
 - Number of mobile data connections (excluding text messaging) as percent of total population;
 - Number of sent text messages out of total population;
 - Mobile data service revenues as percent of total mobile service revenues;
 - Mobile e-mail composite—private users;
 - Mobile Internet composite—private users;
 - Mobile Internet composite—business users;
 - Mobile e-mail composite—business users

- **Environment**
 - Number of 2G/3G network licenses;
 - Percent of population covered by 2G network infrastructure;
 - Percent of population covered by 3G network infrastructure;
 - Allowance of regional price discrimination in relation to required investments

- **Readiness**
 - Mobile Internet pricing as percent of monthly subscription rate relative to purchasing power (personal and business);
 - Government prioritization of Mobile Internet (a qualitative measure using NRI methodology);
 - Importance of Mobile Internet in government's vision of the future (a qualitative measure using NRI methodology).

More research is needed to determine the potential value of these variables. Specifically, if they do contribute to a country's ability to benefit from the Mobile Internet; whether they should be added to

¹⁰ The variables are grouped according to organizational framework of the Network Readiness Index.

a more general index-based assessment such as the NRI; and how to combine these variables into a composite index. Weighting methods, aggregation methods and imputation of missing data in the construction of complex composite indexes are for example described in detail in the OECD's Handbook on Constructing Composite Indicators: Methodology and User Guide, OECD Statistics Working Paper, August 2005.

Measuring the social impact of Mobile Internet requires an application-specific approach

To accurately evaluate the Mobile Internet's social impact on a country, it will take a sophisticated methodology that takes into account the complexities of applications that can be used by the wired Internet or mobile devices. The illustrated variables might be useful to approximate a country's ability to use Mobile Internet but would be unlikely to yield output providing a direct correlation with economic indicators and a derivation of the social impact in monetary terms.

Measuring any social impact **requires an application-driven approach**. For example, mobile payment services create social benefits in multiple dimensions by increasing access to banking services and by lowering transaction costs to drive new efficiencies. Easier exchange of money builds new market linkages, increases employment rates and promotes social inclusion and individual empowerment. As a result, the degree of usage in mobile money transfer services might be a useful proxy to describe an economy's ability to utilize such benefits. Additionally, mobile health applications, such as the remote monitoring of chronically ill patients in industrialized nations, directly reduce health system costs and enable people to stay longer in the job market.

However, it is not possible at this stage to develop one framework for all countries to assess the effect of these types of Mobile Internet applications as they differ significantly across markets. Mobile payment takes different forms in emerging countries (e.g., mobile money transfers) than in developed nations (e.g., contactless payment) and enables different types of benefits. The next stage of research would require identification of the dominant Mobile Internet applications in each country or region and the assessment of the impact of these applications against specific measures to derive a quantified impact on a country level.

Conclusion and next steps

Today, there is no standardized tool that helps private and public parties to assess an economy's adoption of Mobile Internet and any related social impact. Existing findings are fragmented and are of limited use to support a fruitful dialogue between market participants on shaping the still uncertain Mobile Internet ecosystem. There is a clear need to develop a standardized approach to collect, aggregate and interpret related data.

Over the last months, the World Economic Forum has consolidated the existing research into a first set of recommendations on which variables to take into consideration to more effectively measure the social impact of Mobile Internet adoption. Going forward, the World Economic Forum will build upon guidance from the 2009 Annual Meeting and will work with stakeholders in both the public and private sectors to further explore how to best establish a concrete toolkit that can guide a fact-based discussion on the future development of the Mobile Internet.

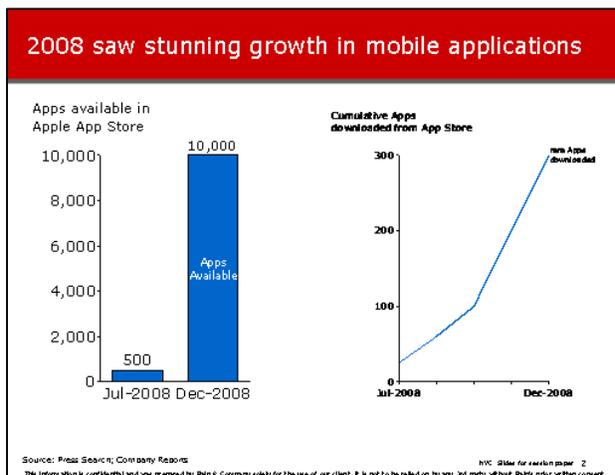
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Hurdles to Further Development of the Mobile Internet

In 2008, we saw significant progress toward wider adoption of the Mobile Internet. While 3G infrastructure build outs continued in many developed and developing markets, devices really garnered much of the spotlight in the past year. New devices with touch screens and dramatically enhanced user interfaces captured consumers' imagination, and large chunks of their wallets. Behind the scenes, industry participants worked hard to reduce the fragmentation of the developer environment for Mobile Internet applications. Open source operating systems, readily available software developer kits, SOA and IMS deployment at the infrastructure level all combined to make it easier, faster and less expensive for developers to reach scale audiences. Participants from all corners of industry (device manufacturers, operators, traditional internet companies) launched easy-to-navigate "app stores" that vied to become consumers' primary gateway to this new generation of mobile content and services. Consumers responded enthusiastically, taking full advantage of their cheaper flat-rate data pricing plans to explore these new opportunities. In



addition many innovative, low-tech services such as mobile payment have been launched in emerging markets and quickly generated both revenue for operators as well as value for consumers.

While these developments are legitimate cause for much excitement, serious challenges remain. Extensive discussions with private market participants, academics and regulators in the main regions over the last 9 months have shown that the following questions are perceived as the key uncertainties in the further evolution of the Mobile Internet.

They fall, broadly speaking, into three categories:

Capacity, Coverage, Content and Consumer Context: Can we provide it economically to everyone who wants it?

This issue is multifaceted. On one end of the spectrum, there are challenges in keeping pace with the exploding data traffic in densely populated urban areas. Many operators have raised concerns about how to manage the backhaul demands that accompany increased data use. They are exploring both new technologies to help pack more traffic onto existing networks, as well as ways to use unlicensed spectrum to move some traffic off net (WiFi, Femtocells, etc.) Will these "fixes" be enough? Or will many operators fundamentally need to rethink their approach to customer segmentation and pricing?

At the other end of the spectrum, there are continuing challenges about how to extend the mobile footprint to rural areas, particularly those in emerging markets. Given the lower spending power of many rural populations, there is a keenly felt need to find lower costs solutions—off-the-shelf network build outs, infrastructure sharing agreements, and so on—and in some cases alternate energy sources as well, if we are to connect the "unconnected." Furthermore, in many of these markets mobile will be the only option for accessing the internet from rural areas, increasing network demands, but also perhaps adding some incentive for governments to shoulder some of the investment.

Content: Why aren't there many more scale applications?

While 2008 brought encouraging signs on the adoption front, we are far from scale adoption. Three different explanations are widely posited to explain this.



The first school of thought argues that, despite the success of Apple and Google drawing more developers into the mobile space with their easy to use software development kits, the environment is still too fragmented: there are too many software platforms, devices, operator standards for even the best applications to reach their addressable market efficiently. If this is the case—is there a solution short of further industry consolidation or agreement on interoperable standards? For example, is there a role for “carrier neutral” VAS providers to help deliver a simplified end-user experience at lower costs for operators? Or will the virtualization trend currently moving out of the data centers and onto the desktop environment also extend to mobile in the near term?

The second argument places the blame on the lack of an effective monetization model. This group argues that the wired Internet environment has essentially conditioned consumers to view content and applications as “free,” by relying heavily on an ad supported model. These industry observers do not feel we will see scale uptake before a mobile advertising model is deployed at scale, which most experts view as 3 to 5 years away at least.

Finally, a third group believes that industry participants have simply underinvested in basic consumer marketing, resulting in a discovery process that is far too complex and time consuming for the average user. To support their position, they point to device manufacturers and operators who have made major investments in overhauling their retail experiences and seen significant growth in consumer uptake as a result.

Consumer Context: How can privacy vs. personalization trade-offs be managed to leverage more of the unique characteristics of the mobile environment?

Perhaps the greatest opportunity to transform the customer experience of the Mobile Internet is to leverage the notion of “consumer context.” Operators clearly own huge repositories of customer-generated data for creating services rich in context and social intelligence. Do they have the internal capabilities to do so? Do consumers trust them (more than other industry participants?) to mine data to develop personalized offerings—or to commercialize anonymous and aggregated customer data responsibly? Would regulatory involvement in creating consumer safeguards accelerate the development of these services? Should regulators go further and mandate opt-in or opt-out policies? Rights of consumers to view, delete or transfer data? What lessons do companies at the leading edge of data mining (search and recommendation engines) offer to participants in the mobile space?

The last joint session of the Telecommunication, IT and Media Industry Partners at the Forum’s 2009 Annual Meeting will debate the relative importance of each of these uncertainties. It will provide insights as to which issues are most critical to resolve in the short term, and which would benefit from a concerted effort across the industries.

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