

MOBILE HANDSET INDUSTRY: *To 3G or Not to 3G?* That is the Question

There's been a lot of discussion in the mobile phone industry about "3G". When will it happen? When will the networks be in place? When will the industry transition? 3G is here today.

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INTRODUCTION

First, what is 3G? The term 3G simply refers to the mobile phone, or cell phone, industry's 3rd Generation set of technologies. Simplistically, the industry is migrating from 2nd Generation (2G) technology (primarily voice networks with slower data rates) to 3G technology, which incorporates faster data rates and higher bandwidth, enabling the high-speed data-intensive applications in demand on today's mobile handsets (internet access, email, video/multimedia, etc.).

In terms of timing, 3G is here today. However, 3G still represents a small portion (some estimate 15% of subscribers) of the industry. This potentially points to opportunity for growth as the industry continues along its transition path. This transition likely will continue for several years.

Why does 3G matter? 3G matters because the industry's migration to 3G paves the way for a wider range of better and more comprehensive services for consumers. And because consumers increasingly demand 3G functionality and capabilities – as can be seen by the success of Research in Motion's (RIM's) most recent BlackBerry devices and Apple's iPhone 3G – the migration to 3G may present interesting growth opportunities for a range of companies. The migration to 3G requires substantial investment in network infrastructure, as well as the growing list of mobile devices that operate on and take advantage of these advanced networks. The providers of these networks and mobile devices, and many of the suppliers into these companies, may benefit from the industry's transition to 3G technology.



BACKGROUND AND STATE OF THE INDUSTRY

The mobile handset industry, which began as the cellular phone industry, has continued to evolve since its beginnings in the mid-1980s – 25 years ago. Originally marked by large, clunky, yet portable cellular phones – typically with spotty signal coverage and frequently dropped calls – the industry has continually innovated. Cell phones continued to get smaller, more reliable, and were supported by ever-improving networks. Importantly, these early telephone-only mobile phones have evolved into complex and powerful mobile handset devices, with an ever-growing range of functions and capabilities.

The market today includes handsets with ranges of capabilities, whether it is just a basic cell phone based on the latest 2G or 3G network, or it is the combination of a cell phone, digital camera, internet browser, email application, and music and video players (to name just a few of today's capabilities). These data-intensive converged mobile devices or "smartphones", are growing as a percentage of the market each year, and will likely continue to evolve and include new functionality and capabilities, not to mention better voice and faster data and media services. To put the size of the industry into perspective, and to understand how ingrained the mobile phone has become in today's global society, there were roughly 3.4 billion mobile users, or "subscribers", on the planet at the end of 2007.

The mobile handset industry has delivered strong high single-digit or double-digit growth for the last seven years. Given negative announcements in recent weeks and months from Nokia, Qualcomm, and a growing list of others, the consensus view calls for a decline in total global handset unit shipments in 2009. The industry is expecting to have shipped roughly 1.23-1.24 billion handset units in 2008, up about 7% from 2007.

Recently reduced 2009 forecasts now look for unit shipment declines in the high-single-digit percentage range (see Deutsche Bank forecast below), with forecasts continuing to change frequently – mostly with negative revisions. This expected 2009 decline is down from double-digit unit growth over the last several years, largely driven by Asia – of which China has been a substantial component.

The table on the next page represents Deutsche Bank's forecast for the industry, although there are a range of estimates out there for 2009, with some calling for unit declines of 6% to 10% or even more in 2009. While 2009 is looking to be a challenging year, the mobile handset industry is likely to remain an important technology sector that presents numerous opportunities for growth in the coming years.



Figure 9: DB Global Handset Model (units, '000s)

Handset Shipments

By Region (in thousands)	2004	2005	2006	2007	2008E	2009E	2010E	2011E	2004-11 CAGR
Handset Unit Shipments									
Western Europe	130,722	205,001	209,364	198,517	177,550	150,906	163,991	174,915	4.2%
Eastern Europe	81,594	95,287	116,276	126,415	121,481	101,169	110,097	121,170	5.8%
Asia	249,606	303,511	374,076	450,328	524,947	501,380	547,020	593,206	13.2%
Developed Asia	71,959	78,005	88,142	97,397	95,218	79,833	82,893	88,304	3.0%
China	107,201	128,136	146,483	161,799	180,773	180,624	194,408	212,027	10.2%
India	20,128	31,533	53,728	87,934	118,896	119,127	131,227	143,556	32.4%
Indonesia	14,367	18,316	23,210	28,896	35,849	32,743	37,100	41,607	16.4%
Developing Asia	35,950	47,520	62,514	74,302	94,212	89,053	101,392	107,713	17.0%
North America	124,733	128,347	141,992	149,211	143,245	119,989	130,745	141,015	1.8%
Latin America (Ex. Brazil)	31,283	43,144	55,379	63,272	66,102	54,280	59,476	65,860	11.2%
Brazil	20,540	21,528	28,096	34,360	38,962	34,032	36,323	39,205	9.7%
Africa/Middle East	40,947	58,530	95,382	120,804	139,734	128,798	141,686	157,449	21.2%
Total Unit Shipments	679,426	855,347	1,020,566	1,142,907	1,212,021	1,090,554	1,189,338	1,292,820	9.6%
y/y growth	19.9%	25.9%	19.3%	12.0%	6.0%	-10.0%	9.1%	8.7%	

By Technology (in thousands)	2004	2005	2006	2007	2008E	2009E	2010E	2011E	2004-11 CAGR
Handset Unit Shipments									
GSM	476,814	612,979	702,159	744,808	735,024	546,235	504,691	451,751	-0.8%
# GSM	204,317	124,290	34,005	-	-	-	-	-	NM
# GPRS	253,685	371,389	459,764	388,934	289,110	152,980	104,371	69,920	-16.8%
# EDGE	18,812	117,299	208,390	355,874	445,915	393,255	400,320	381,831	53.7%
WCDMA	18,029	59,938	106,485	181,194	264,727	349,689	474,337	613,166	65.5%
#WCDMA	18,029	59,937	100,182	142,202	148,071	140,444	121,099	87,386	25.3%
#HSDPA	-	1	6,303	38,992	116,656	209,245	353,238	525,780	NM
CDMA	151,212	159,843	196,794	206,923	207,189	192,021	209,885	227,746	6.0%
# CDMA	3,698	0	-	-	-	-	-	-	NM
# CDMA2000 1xRTT	136,491	136,322	150,894	134,779	107,927	76,643	50,437	21,667	-23.1%
# CDMA450	-	-	-	-	-	-	-	-	NM
# CDMA2000 1xEV-DO	11,023	23,521	45,900	72,144	99,262	115,379	159,448	206,079	51.9%
TDMA	12,125	7,444	4,515	1,443	-	-	-	-	NM
iDEN	6,626	5,975	5,773	5,921	3,402	1,749	145	157	-41.4%
AMPS/Other	14,620	9,167	4,839	2,618	1,679	860	279	-	NM
Total Unit Shipments	679,426	855,347	1,020,566	1,142,907	1,212,021	1,090,554	1,189,338	1,292,820	9.6%
y/y growth	19.9%	25.9%	19.3%	12.0%	6.0%	-10.0%	9.1%	8.7%	

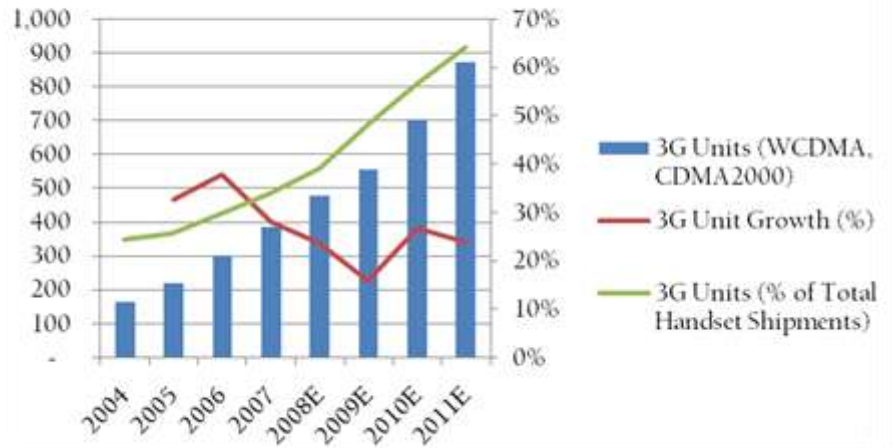
Source: Deutsche Bank, Informa, company data, GSA, 3GPP

3G TECHNOLOGY AND MARKET OVERVIEW

While there are differing definitions, we estimate 3G units as the combination of WCDMA and CDMA2000 (both 1xRTT and EV-DO technologies) from the chart above. Using this definition, total 3G units are expected to grow from 472 million in 2008 to 841 million in 2011 (per Deutsche Bank's estimates), or a 21% compound annual growth rate, or CAGR (26% CAGR from 2004 to 2011). This would take 3G units from 24% of total handset units shipped in 2004, to 39% in 2008, and to 65% in 2011.

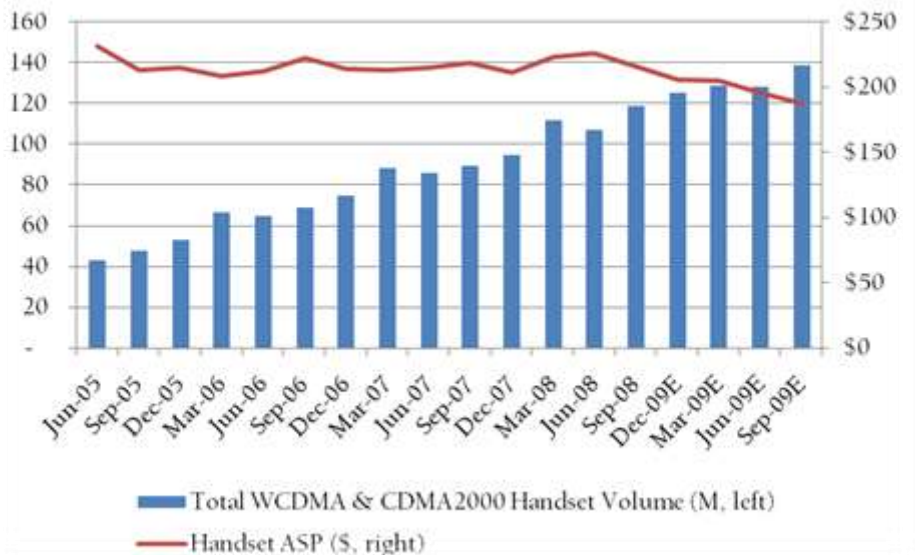
The following chart shows how 3G handset units have continued to deliver roughly 25%-40% annual growth from 2005 to 2008. While the 2009 prospects are more challenged given the current environment, robust 3G growth is expected to continue once the industry emerges from the current weakness. Based on the ongoing implementations of global 3G networks, coupled by the increasing number of 3G handsets – also driven by 3G smartphone growth – we expect 3G technology to represent a significant growth opportunity in the coming years.

3G Devices Shipped (millions)



Looking at the quarterly performance of 3G handset units and their ASPs (average selling prices), the chart below demonstrates that the quarterly run rate for 3G units has steadily ramped higher over the last few years. Importantly, the chart also illustrates that ASPs have held fairly steady in the \$140 range over the same few years. While estimates point to modest ASP declines in 2009 due to the macroeconomic landscape, pricing has remained resilient in the 3G segment; we believe largely due to the ever-expanding capabilities of 3G handsets. Looking forward, should handset pricing remain robust, growth in 3G units could result in solid performance from suppliers of 3G technology in the coming years. However, if the opposite scenario plays out – namely, if 3G/smartphone suppliers aggressively compete on price – revenue and profit growth may be negatively impacted, even with strong unit growth. This is certainly an important facet of the industry to watch closely.

3G Handset Volume & ASP



From a technology perspective, most of the 3G technologies currently being implemented are based on CDMA (code division multiple access) technology. CDMA is one of the technology backbones to today's networks, enabling multiple users to share a bandwidth of frequencies – this is called multiplexing. The most widely implemented 3G technologies to date are WCDMA and CDMA2000, although TD-SCDMA (in China) and WiMax are additional technologies that may grow as networks are implemented.

WCDMA, or Wideband CDMA, enables faster data transfer rates than 2G and 2.5G/2.75G technologies such as GSM and GPRS/EDGE, respectively. WCDMA supports data rates up to 14 Mb/s (megabits per second), with its most recent updated technology – called HSDPA (high speed downlink packet access). In many cases, the newest 3G handsets such as the Apple iPhone 3G and new models from RIM and HTC, are based on HSDPA technology. HSDPA is essentially the newest version of WCDMA being implemented today.

CDMA2000 is another CDMA-based 3G technology that has been implemented, although it enables data rates that are slower than those offered by WCDMA. CDMA2000 is not compatible with WCDMA, and has evolved into several “flavors”, including CDMA2000 1xRTT (1-times radio transmission technology) and CDMA2000 EV-DO (Evolution-Data Optimized). CDMA2000 technology supports data rates up to 3.1 Mb/s in its EV-DO implementation.

GSM (global standard for mobile communications) technology, is a primary global 2G technology, and also has evolved to include so-called 2.5G (GPRS) and 2.75G (EDGE) technologies. The GSM Association claims that over three billion mobile subscribers (approximately 86% of global users) use GSM technology, making it the largest user base by far. However, we would expect that 3G technologies will erode a material portion of that market share in the coming years. GSM supports data rates up to 9.6 kbit/s (kilobits per second). GPRS (general packet radio service), the 2.5G technology based on GSM, enables data rates up to 40 kbit/s. Further enhancements to GSM networks came with the 2.75G EDGE technology (Enhanced Data rates for GSM Evolution), and offered roughly three times the data rates of GPRS. The incremental process of GSM-GPRS-EDGE has enabled a relatively efficient and cost effective path to higher data rates on the GSM infrastructure, although data rates still do not effectively compare with 3G network technology. According to the GSM Association, WCDMA (and its enhancements such as HSDPA and others) is the global GSM community's chosen path to 3G.

THE TRANSITION TO 3G

3G is here today, although it is still relatively early in its transition on a global basis. Some estimates place 3G at roughly 15% penetration today in terms of global subscribers using 3G technology. At the end of 2007, assuming an estimated 3.4 billion mobile subscribers in total, this would place the number of 3G subscribers at roughly 500 million. The extent of the rollout of 3G technology today varies from region to region and country to country. The first 3G networks were launched in Japan in 2001 and Korea in 2002, and the list of countries and extent of coverage has continued to grow. To illustrate the coverage in the U.S., two maps below show the current GSM (2G) and EDGE (2.75G) coverage from AT&T, as well as the current 3G network coverage. While this is only one carrier's coverage, it gets the point across.



AT&T GSM (2G) Coverage Map (orange = coverage), source: AT&T



AT&T EDGE (2.75G) Coverage Map (lighter blue = coverage), Source: AT&T



AT&T 3G Coverage Map (dark blue = coverage), Source: AT&T

As the maps show, 3G coverage still has a long way to go to achieve the fairly ubiquitous 2G (and 2.5G/2.75G EDGE network) coverage that is in place in the U.S. today. However, it is worth noting that 3G coverage today is focused in major metropolitan areas, as one would expect, and likely covers a much more significant portion of subscribers than its geographical depiction would portray.

On a more global basis, certain portions of Asia boast much more significant coverage and penetration. In Japan and South Korea, for example, where the first 3G networks were launched about seven years ago, 3G penetration is estimated at over 70%. Looking to China and its roughly 600 million mobile subscribers (China Mobile – China’s largest carrier – alone boasts 450 million subscribers), the 3G transition is just beginning. Licenses to implement 3G networks were only recently awarded by the Chinese government, paving the way for the rollout of 3G technology in the coming years. Given China’s sizable market and growing subscriber base, China has the potential to drive growth in 3G for a number of years.

The industry’s transition to 3G has had its delays, and accordingly, its skeptics. Many industry watchers and analysts have been touting the coming transition to 3G for a number of years and have watched a slower migration than was hoped for in many cases. With that said, it appears that progress over the last few years has resulted in a 3G footprint that has achieved critical mass (15% of global subscribers, ~40% of 2008 handset shipments). As this momentum continues and consumers look for increased bandwidth, the transition to 3G could drive several facets of growth for years to come.

While the broader environment for wireless handsets has weakened looking into 2009, the migration to 3G is likely to continue, which potentially could reduce (although not entirely offset) the negative near-term fundamental impact on 3G phones, smartphones, infrastructure, and suppliers into these devices – even as we move through the current challenging environment and look for the eventual return to broader industry growth.

THE SMARTPHONE FACTOR

The smartphone, or converged device, segment of the handset industry includes devices that integrate a mobile phone with other features, such as email, internet access, mp3 (music) players, FM radio tuners, GPS, video, multimedia, and other applications. Smartphones can be based on 2G (or 2.5G) or 3G networks (and 3G smartphones typically work on both), so it is not a 1-to-1 correlation to the 3G handset segment. That said, the rollout of 3G technology opens the door for a wider array of smartphone products with increased capabilities – likely supporting further growth of the smartphone market and accordingly, increasing consumer demand for 3G networks.

Smartphones are currently selling at a rate of about 40 million new units shipped per quarter (as of Q3 2008), for a 2008 estimated total of 157 million units per market researcher IDC. IDC estimates 2009 growth of 26%, for total smartphone shipments of 198 million units. This places smartphones at roughly 13% of the total handset market on a unit basis in 2008, and a little over 17% in 2009 (based on IDC and Deutsche Bank estimates). On a dollar basis, with their higher ASPs, smartphones have grown to represent a larger portion of the total handset market – ramping from an estimated 5% in Q1'2006 to 22% in Q3'2008 – with Q3'2008 nearly doubling from the 11%-12% range of the prior three quarters. The Apple *iPhone* 3G ramp in Q3'2008 was the primary reason for the substantial jump.

Unit-based smartphone market share trends

Figure 3: Smartphone vendor global market share trend (from IDC)

	3Q07	4Q07	1Q08	2Q08	3Q08	QoQ	YoY
Nokia	49.4%	48.7%	42.9%	41.7%	36.9%	-480	-1,254
Apple	3.5%	6.0%	5.0%	2.0%	16.4%	1,444	1,293
RIM	10.2%	10.4%	12.6%	15.4%	14.3%	-99	419
Motorola	6.9%	6.0%	5.6%	7.5%	5.7%	-176	-120
HTC	2.5%	4.1%	4.1%	4.8%	5.5%	77	306
Samsung	1.7%	2.3%	3.2%	3.6%	3.7%	10	194
Sony Ericsson	3.6%	2.8%	2.1%	2.5%	2.5%	1	-110

Source: IDC

Dollar-based handset & smartphone vendor (RIM, Apple, HTC) market share

Figure 9: Sales market share trend in the handset/smartphone space

	1Q06	2Q06	3Q06	4Q06	1Q07	2Q07	3Q07	4Q07	1Q08	2Q08	3Q08
Nokia	37%	37%	36%	37%	39%	42%	41%	41%	40%	39%	33%
Samsung	17%	15%	15%	13%	15%	14%	15%	13%	16%	16%	17%
Motorola	24%	26%	24%	24%	19%	14%	14%	13%	10%	10%	9%
LG	7%	7%	7%	7%	8%	9%	8%	8%	10%	11%	10%
Sony Ericsson	10%	10%	13%	15%	14%	14%	14%	14%	12%	12%	11%
RIM	2%	2%	2%	3%	3%	4%	4%	4%	6%	7%	7%
Apple	0%	0%	0%	0%	0%	0%	2%	3%	3%	1%	11%
HTC	3%	3%	3%	3%	2%	3%	3%	3%	3%	3%	3%
Smartphone makers	5%	5%	5%	5%	6%	7%	9%	11%	12%	11%	22%

Note: 1) 3Q08 is based on recently released results and sales estimates; 2) for Apple, the numbers are based on the iPhone shipment (based on the company's released numbers) * ASP (US\$500 for 1Q07- 2Q08 and US\$600 for 3Q08)
Source: Deutsche Bank, company data

Notably, the smartphone market share leader is Nokia, who is also the largest handset vendor overall. However, Nokia's market share in smartphones has been deteriorating from the 50% level in early 2007 to the current 35% level (Q3'2008).

This sharp decline in the last few quarters was driven by sharp unit ramps at Apple and RIM, as well as more modest increases (in market share percentage terms) at Taiwan-based HTC. Nokia has recently launched several new devices and service offerings in recent weeks in an attempt to hold and regain market share. However, Nokia has more limited market share in the U.S., where a larger portion of RIM's and Apple's business has come. One cannot ignore Nokia given their leading global handset market position, but they are fighting against several share gainers with strong product momentum in the smartphone space – Apple, RIM, and HTC.

As discussed above, smartphones represent a smaller sub-segment of the 3G market today (and some smartphones are still based on 2.5G/2.75G technology), although it is likely to be a core driver of 3G growth in the coming years. Smartphone shipments grew 28% to 40 million units in Q3'2008, from 31 million units in Q3'2007. Per Canalis market research estimates, smartphones represented about 13% of total handsets shipped in Q3, up from 11% in Q2. As noted above, current industry commentary points to smart phone growth moderating in the current recessionary macroeconomic environment, from prior expectations of 40%+ growth, to the more recent 20-25% range for 2009, with some forecasts looking for more conservative growth. Even with the broader slowdown in industry handset demand, the growth in smartphones and consumers' desire for devices with an expanded set of capabilities, could support the industry's transition to 3G technologies. With that said, however, forecasts for handsets and smartphone growth have continued to come down in recent weeks, leaving the prospect of more limited (or even negligible or negative) smartphone growth in 2009 a distinct possibility.



CONCLUSION: 3G DRIVES GROWTH

Industry dynamics and performance over the last few years illustrate that the transition to 3G technologies is real, has achieved critical mass, and 3G has the potential to continue to grow its share in the mobile telecommunications (infrastructure, devices, and services) industry. While the recent, current, and forecasted 2009 macroeconomic environment will likely have an impact on 3G growth in the near term, the opportunity for growth over the next few years is significant.

3G technology has enabled a generation of devices that combine an increasing set of capabilities – all driving consumption of more bandwidth and data by consumers. This seemingly never-ending thirst for data – whether it be through email, internet, multimedia, or other applications – is likely to continue to drive carriers to expand their 3G networks and services, and will likely drive mobile device suppliers to continue to innovate and deliver exciting devices for consumers to buy.

From an investment perspective, these trends also point to investment opportunities across the mobile technology landscape. The 3G opportunity drives the need for new infrastructure equipment and mobile handset devices, and the components and technologies that comprise these products. This potentially points to interesting investment opportunities among smartphone suppliers, semiconductor suppliers with a focus on 3G technology, and those companies with a strong intellectual property position in 3G technologies. While the market outlook for many of these companies looks uncertain heading into 2009, 3G technology may represent a longer-term growth opportunity for such companies in the coming years. ■

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