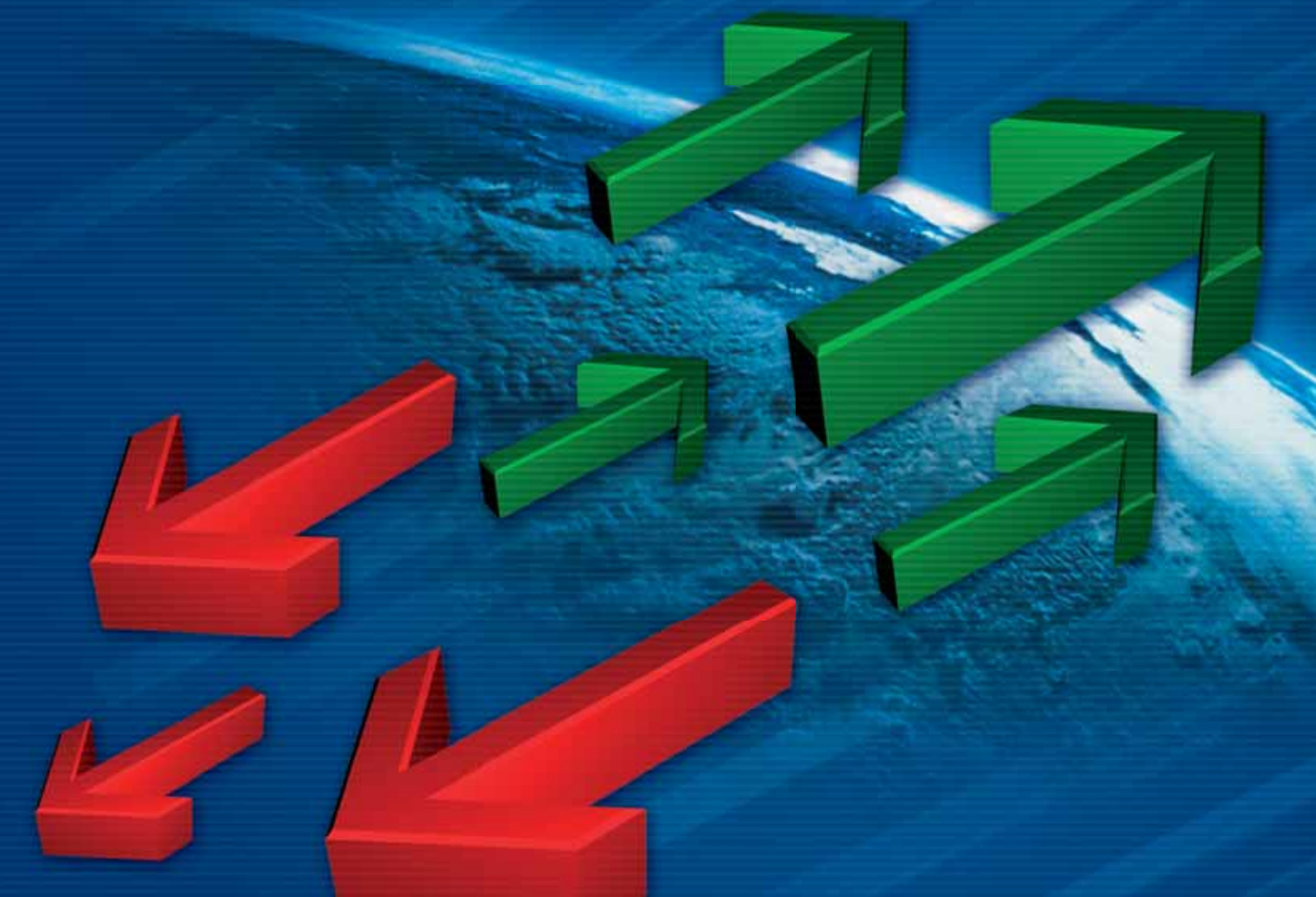
Confronting the CRISIS

Its Impact on the ICT Industry

February 2009



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Message fro

Dr Hamadoun I. Touré
ITU Secretary-General

m the ITU Secretary-General

We live in turbulent times. The credit market difficulties that had simmered throughout 2007 erupted into a full-blown financial crisis in mid-September 2008, which broke out during an otherwise promising year for the ICT industry. The global economy is now navigating uncharted waters. Unprecedented events have taken place in the banking sector, finance and credit markets, including the disappearance of several global financial icons, and the consequences are far from clear.

Indeed, many forecasting firms are now struggling to predict the future direction of the economy, on the basis that their previous models no longer apply. The difficulties have spread from the financial markets to the general economy, adversely affecting employment and consumer demand. The world's largest economic zones are now officially in recession, including the United States, Japan and the European Union.

ITU remains deeply concerned by the impact of the financial crisis on its Member States and Sector Members. That is why I have commissioned this Report, bringing together informed analysis from leading experts on the future outlook for the industry. This Report explores how the financial crisis may impact the ICT industry, including telecommunications. However, ICTs also offer key means of helping ITU Member States weather the economic storm, not only as a key sector in their own right, but also by boosting economic growth and increasing economic productivity and efficiency. In these uncertain times, there are few certain answers – this Report offers a range of different perspectives on the impact of the crisis by leading authorities in the field for readers to consider.

In many ways, the ICT industry is in better shape today than after the *dot.com* crisis of 2001/2002. In many countries, the Internet is now a mainstream feature of present lifestyles; global communication networks underpin international trade and finance; modern working methods are based on constant connectivity 'anywhere, anyhow, any time'. Operators and Internet service providers that had already shed excess capacity after the *dot.com* bubble now enjoy regular income from established clients; their services are in demand; new and innovative applications are being introduced and are gaining market acceptance. ITU remains resolutely committed to connecting the world. The crisis may challenge many firms, but it will also revitalize the industry and enable new entrants with new technologies to thrive. Technological transformation is at the very heart of our industry – I firmly believe that our industry can only emerge stronger and more resilient from these challenging times.

1.

Executive Summary

The world is in the grip of an exceptional financial crisis that has shaken the global economic system to its foundations. Leading economists acknowledge that the global economy is facing the worst crisis in sixty years. What initially started as a niche problem in the United States mortgage market has now triggered a global economic slowdown (**Section 2: A Story of Crash, Crunch and Crisis**).

It is difficult to speak of one crisis - financial or economic. Instead, market difficulties now encompass a set of challenges: problems in the property market; the credit crunch and drying-up of commercial and inter-bank credit; the failure of several major banks; and global economic slowdown. This crisis has the potential to affect the world economy, its institutions and its industries, with far-reaching consequences, compared with previous downturns (**Insight 1**). Current indicators are bleak, while the OECD predicts that the economic recovery is likely to be slow and will not start before late 2009 (**Section 2.2: A Gloomy Economic Outlook by the OECD**).

But what are the consequences for the global ICT industry? Telecommunications and the Internet are now vital service platforms, underpinning much of international trade and the global financial system, not to mention personal communications. ICTs are pervasive general purpose technologies. Even before the crisis, telecommunications were undergoing a transformation towards advanced Next Generation Networks (NGNs) and converged services revolutionizing the roles of telcos, Internet Service Providers and media/content delivery companies (**Insight 9**), as well as their regulation (**Section 4.4**). The difficulties in finding funding now faced by some telcos threaten to derail investment in NGNs, but the crisis could also create new openings for nascent technologies (**Insight 4**). The ICT industry is founded on innovation, and while the economic turmoil may challenge some, it can also overturn the established order and stimulate the emergence of new entrants with new technologies.

Key Findings

This Report explores the impact of the financial crisis. Among the many insights contributed to the Report, several key findings emerge:

▷ Funding issues are unlikely to be resolved until the banking sector is recapitalized. The financial difficulties faced by the private sector could add to pressure for government intervention in the financing of national backbone infrastructure (**Section 4.1**).

▷ Unproven business models are unlikely to get financing, especially high-cost and high-risk start-ups. For venture capital, sound business models with proven demand and early cashflows are needed (**Insight 19**). Higher-priced services needing large investments will become more difficult to justify.

▷ Economic turmoil may however present opportunities for disruptive technologies and/or business plans to emerge, which are unlikely to come from traditional players (**Insight 4**).

▷ Mobile operators are better-placed than fixed operators to weather the economic storm, due to greater flexibility in their cost structure and capex (**Section 4.1**) and fixed-mobile substitution (**Insight 7**).

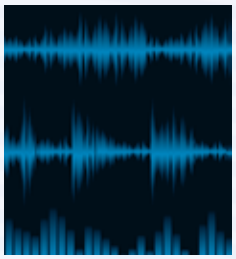
▷ The demand for basic ICT services is income-inelastic, but demand for advanced applications is more uncertain (**Section 4.2**)

▷ Telecom services are likely to come under further price pressure, as operators will fight for a more cost-focused customer, resulting in further erosion of margins (**Sections 4.3 and 5.1**).

▷ Operators will take a more rigourous approach to cost control and search for further improvements in internal efficiency (**Insight 5 and Section 4.3**), including reductions in headcount and infrastructure-sharing.

Immediate Impact

The most immediate impact of the credit crunch and financial crisis is a lack of readily available credit and higher commercial interest rates (**Section 4.1: Investment & Financing**). The cuts in central bank interest rates in some countries have not been reflected in rates for commercial lending, as banks seek to revive their balance sheets. Meanwhile, banks' risk profiles have been transformed to veer on the side of ultra-caution, with banks imposing



stringent lending requirements on borrowers. The difficulties in the credit market have seen refinancing costs rise sharply, with recent telco debt issuance being secured at spreads of up to 4.75% in late 2008 (**Table 1**), up by 3-4% compared to the situation pre-crisis (depending on individual firms' debt ratings). Firms seeking funding for investment now need proven credentials, sound business plans with early cashflows, and preferably pre-existing relationships with lenders (**Insight 19**).

This situation is all the more urgent, given estimates of the supply-side investment needed to modernize the global information infrastructure. A recent study by Nemertes concludes that demand will exceed total broadband capacity at the access layer of the Internet by 2012, with the situation worse than originally projected in the United States. Nemertes estimates the global cost of upgrading the Internet to keep pace with demand at US$ 137 billion over the next five years, with network operators in North America spending 60-70% less than they should be (**Section 4.1: Investment & Financing**). There may already be, therefore, a major shortfall in the investment needed to bridge the gap between demand and capacity, a shortfall that the financial crisis will only exacerbate.

Alternative sources of financing are needed. There is growing pressure on governments to help finance the build-out of broadband networks on the basis that these represent important national infrastructures. Many European governments have advocated the need for new IP-based network platforms, and may experience difficulties in allowing them to be postponed, due to the financial difficulties of hard-pressed commercial operators. In September 2008, both the Italian and Greek Governments announced plans to invest in national NGN infrastructures. Where bank finance is not available, operators may increasingly explore vendor-financing deals and other types of funding.

Telephone network operators (telcos) and service providers are responding to by taking a rigorous approach to cost control, including reductions in headcount. Many analysts highlight differences in cost structure between fixed and mobile operators, with mobile operators enjoying greater flexibility in terms of capex commitments (as capex represents only 20-30% of total costs for mobile operators). Mobile operators have invested heavily in 3G, but now extra funds may be needed for upgrades (e.g. those based on high-speed packet access or HSPA)

to provide a platform for entry into data services. Operators are also likely to undertake greater network-sharing to cut costs and boost coverage, for only limited amounts of extra capital needed. Growth rates in regional mobile capex may slow, but capex will probably not decline on a global basis (**Figure 4**).

Investment in NGN is less discretionary for fixed-line operators, however, competing with new market entrants, capacity resellers and cable TV operators (and increasingly, mobile broadband too). Universal service obligations may also prevent fixed capex from falling. Several carriers have reported cuts in capex of 10-15%, but industry analysts Informa find that operators' investment plans have not been 'severely altered' so far, while many operators acknowledge the importance of investment to ensure that quality of services is maintained (**Insight 5**).

In terms of regulation, confronted by more expensive financing and uncertain demand, operators are likely to push for regulatory holidays to justify investments (**Insight 15**). The regulatory landscape is already undergoing a major transformation in the shift to NGN. As operators share infrastructure to control costs, there may be greater need for regulation of shared infrastructure to ensure equitable access. Meanwhile, greater M&A activity could accelerate the emergence of converged services, with a growing need for convergent regulation cutting across previously distinctive sectors.

Information and Communication Technologies

In terms of consumer demand, some analysts point out that during the last recession, mobile telephony and broadband Internet access were not yet mass-market services (**Section 4.2: Consumer Demand; Insight 18**), suggesting that consumer demand for these services has never been seriously tested by a severe recession. Old studies of the income elasticity of demand suggest that telecom services were luxury services in developing countries, but this is less true now, while demand might be rather more inelastic in developed countries. There is evidence of reduced demand for broadband service in some developed economies, although worldwide, demand for broadband services is so far relatively robust (**Insight 18**).

The impact of the financial crisis on the mobile markets was not yet evident in the Q3 2008 numbers and is only starting to show in Q4 2008 numbers (**Insights 12 and 13**). Mobile telephony is the communication technology with the single greatest promise to bridge the digital divide (**Section 4.6: WSIS Targets**). In December 2008, the global market for mobile passed the milestone of four billion mobile connections. This is equivalent to more than half the world's population having access to a mobile, although in practice the penetration rate is probably well below 50% due to multiple handset ownership. Growth in mobile has been especially driven by strong expansion in the large emerging markets (especially India and China). Most analysts see no reason why growth in these markets will not continue unabated – indeed, fixed-mobile substitution may intensify due to the financial crisis (**Insights 6 and 12**).

In contrast to mobile, global sales of fixed and mobile WiMAX equipment had already fallen in Q3 2008 according to the research firm Infonetics, and may reduce throughout 2009 due to the recession. With fewer resources available for network roll-out, WiMAX deployment is likely to be inhibited over the next year. Infonetics expects revenue growth to return to the overall market for WiMAX in 2010, fuelled by mobile WiMAX and developing markets. Maravedis considers that the financial crisis has already affected smaller suppliers in the WiMAX ecosystem (**Insight 16**), but they do not expect it to result in a major shake-out of the industry yet. The WiMAX Forum anticipates that growth will continue, despite the crisis (**Insight 17**).

For NGN deployment, although some projects have been postponed (**Section 4.1**), many operators are proceeding apace with roll-outs, as NGNs are perceived as the future foundation of the industry (**Section 5.3: Broadband Internet and NGN**). However, the amounts needed for investment in advanced fibre-based networks are phenomenal, costing an estimated six plus times more for rural deployments as for urban, high population-density areas. Based on the United Kingdom, Analysys Mason estimates that nationwide deployment of Fibre-To-The-Curb (FTTC) would cost three to four times more than the telecom sector has currently spent to date on deploying the current generation of copper-based

broadband services. Faced with a credit crunch, the deployment of NGNs could be delayed, unless more imaginative funding schemes and/or state involvement (at local or national levels) arise.

The satellite industry is dominated by large capital-intensive transactions with complex financing packages and long lead times, and could be thus particularly vulnerable to the financial crisis. Satellite's role as a 'gap-filler' for service provision to remote areas could also make it more vulnerable during a downturn, if consumer demand weakens in the recession. However, the roll-out of mobile broadband networks means that the role of satellite for cellular backhaul is growing. Further, the long lead times to launch also shield the industry to some extent, since current activity is a reflection of projects planned a number of years ago. The impact of the financial crisis on the satellite industry is unlikely to be fully felt for 2-3 years, equivalent to the lead time to procure, build and launch a satellite. This partly explains why many industry observers are still positive – today's activity reflects deals negotiated during the height of the boom and recent growth projections remain positive (**Insight 19**).

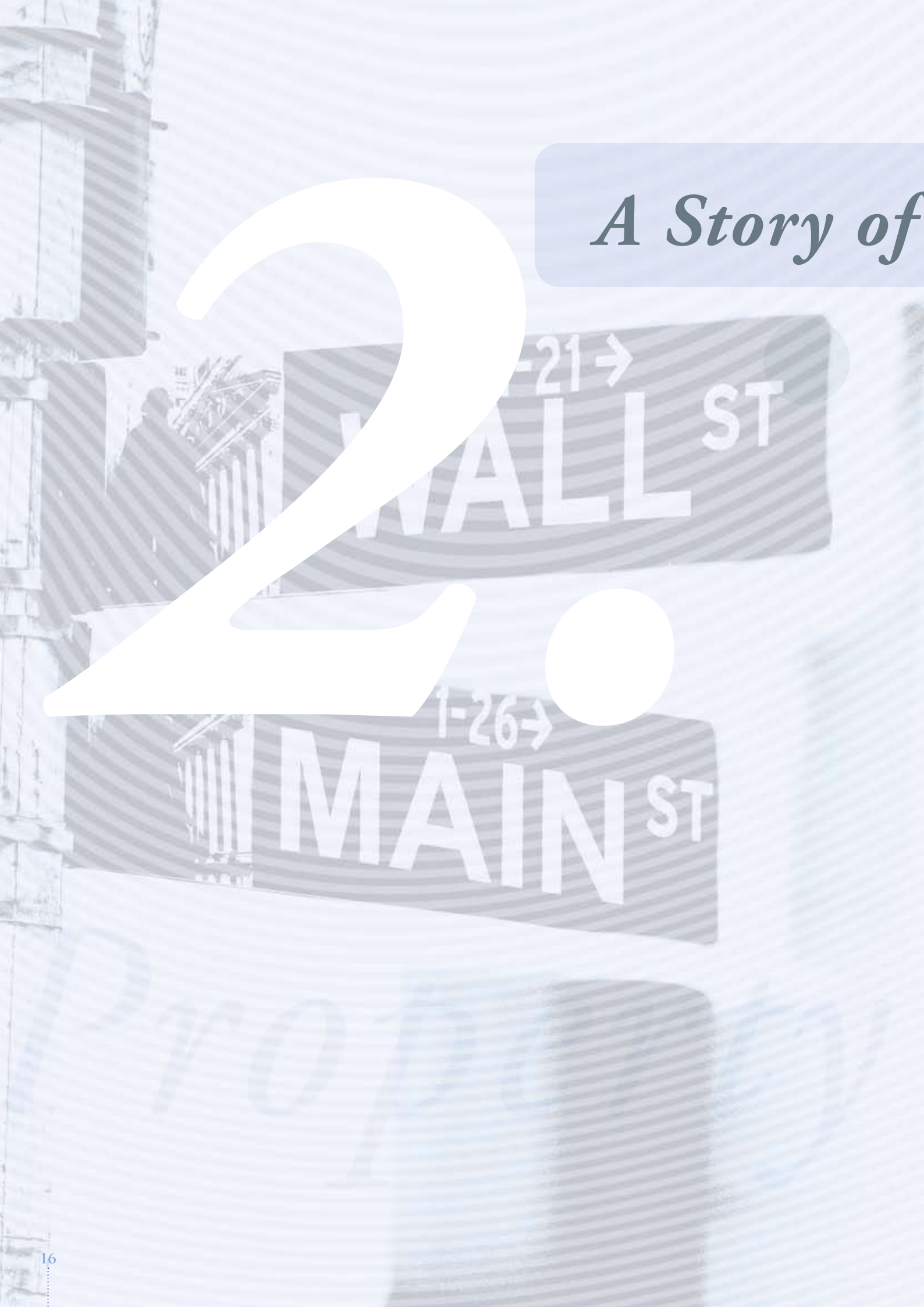
Investing in the Future

The massive uncertainty surrounding current market conditions has left many economists struggling to make credible forecasts of the direction of the global economy. The speed with which the crisis has spread makes it difficult to predict how consumer demand, operator revenues and regulatory responses will evolve. This Report does not provide answers; rather, it offers a range of perspectives from leading authorities on how the crisis could impact the ICT industry, and telecommunications in particular.

The ICT industry is a major driver of economic growth and vital industry in its own right, underpinning many other critical sectors. ICTs are key technologies helping ITU Member States weather the economic storm, by boosting economic growth and increasing economic productivity and efficiency. Many communication technologies (including mobile telephony and broadband) still offer huge growth potential, with or without a recession. Eco-ICTs may also yield real savings in operational costs that could help firms survive (**Section 4.5: Eco-ICTs**) and be more environmentally-friendly.

Previous downturns show that economic crises create openings for disruptive technologies (**Insight** 4). The current financial crisis is likely to follow a similar pattern. In some ways, it will reassert the old order with those ICT companies with sustainable business models, stable cash-flows and deep pockets regaining some of the ground they have lost to new market entrants. But it will also create new opportunities for firms with disruptive technologies to prosper, especially where prices are falling and where technology is changing (**Insight** 4). Investing in innovation and knowledge is even more vital in times of crisis, not less so, and could enable the global economy to navigate its way out of this crisis. Ultimately, for an industry founded on innovation and technological change, the financial crisis may challenge some firms, but it will also revitalize the industry and enable new entrants with new technologies to thrive.

2. *A Story of*



Crash, Crunch and Crisis

2.1 Origins

A crisis that originated in the market for sub-prime mortgages in the United States has now escalated to global proportions, shaking the global financial sector to its foundations and afflicting the economies of many industrialized countries. Recent growth forecasts for developed countries are notable for their complete lack of optimism. Output in advanced economies for 2009 is forecast to contract for the first time ever in the post-war period,[2] whilst GDP growth for developing countries is set to decline from 7.9% in 2007 to 4.5% in 2009.[3] A financial crisis on this scale has not been witnessed since the Great Depression.[4] A golden era of abundant credit has ended, as we enter a new era with the immediate task of rebuilding the global financial system.

The origins of the current crisis lie in the expansion of mortgage lending to the sub-prime market in the US from the late 1990s onwards (**Figure 1**). Property prices were driven higher through massive growth in lending, low interest rates and the steadfast belief that housing was a 'safe' investment. Mortgages were then packaged into complex debt instruments, which became increasingly popular, as investors diversified portfolio risk in their 'search for yield' and mortgage lenders passed on credit risk to investors through mortgage pools, providing ever greater incentives for sub-prime lending.

Investment banks worldwide became exposed to the US sub-prime market through their holdings of these mortgage-backed securities. Their exposure was further intensified by the growing tendency of banks to be over-leveraged, using borrowed funds to augment returns.[5] The US housing market faltered towards the end of 2005 and burst in mid-2006. Defaults and foreclosures have reached staggering proportions, depressing house prices still further. The mortgage-backed securities that had been so sought after now became 'toxic assets', with growing exposure around the world.[6]

HSBC was among the first to suffer, when it reported write-downs of US$ 10.5 billion on sub-prime investments in February 2007. Interbank lending slowed, as trust between banks faltered and banks struggled to quantify their exposure to bad debts and toxic assets. A 'credit crunch' developed from mid-

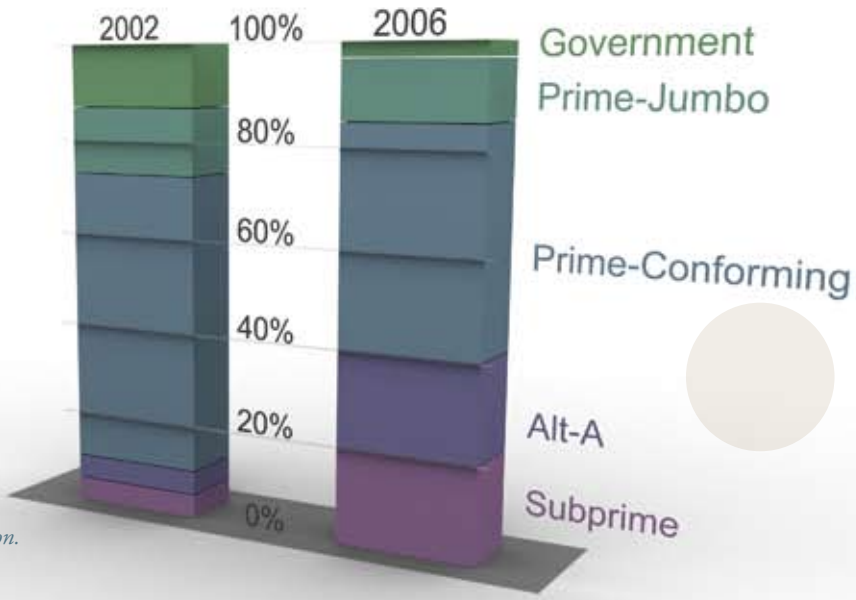
2007 onwards, as short-term interbank and commercial lending dried up to a fraction of previous levels. Governments have been forced to intervene with capital injections and debt guarantees to restore liquidity; however, funding issues are likely to persist, until the banking sector is recapitalized.

The financial crisis spread to the real economy, as consumer and business confidence collapsed in the wake of Lehman Brothers' bankruptcy in mid-September 2008. Recessionary fears caused stock markets to crash, whilst oil prices have plunged to under US$ 40 a barrel in autumn 2008 in response to slowing demand.[7] Both the United States and European Union (EU) are now officially in recession[8] (meaning that they have experienced at least two successive quarters of negative growth). This comes partly as a result of expensive or inaccessible credit and negative wealth effects from falling equity and property values. Some countries (notably Iceland, Latvia and Hungary) have experienced even greater economic turmoil and have applied for multi-billion dollar loans from the IMF.[9]

Figure 1:

And the Culprit is...

Distribution of US Dollar Mortgage Originations



Source: Bridgewater/US National Housing Association.

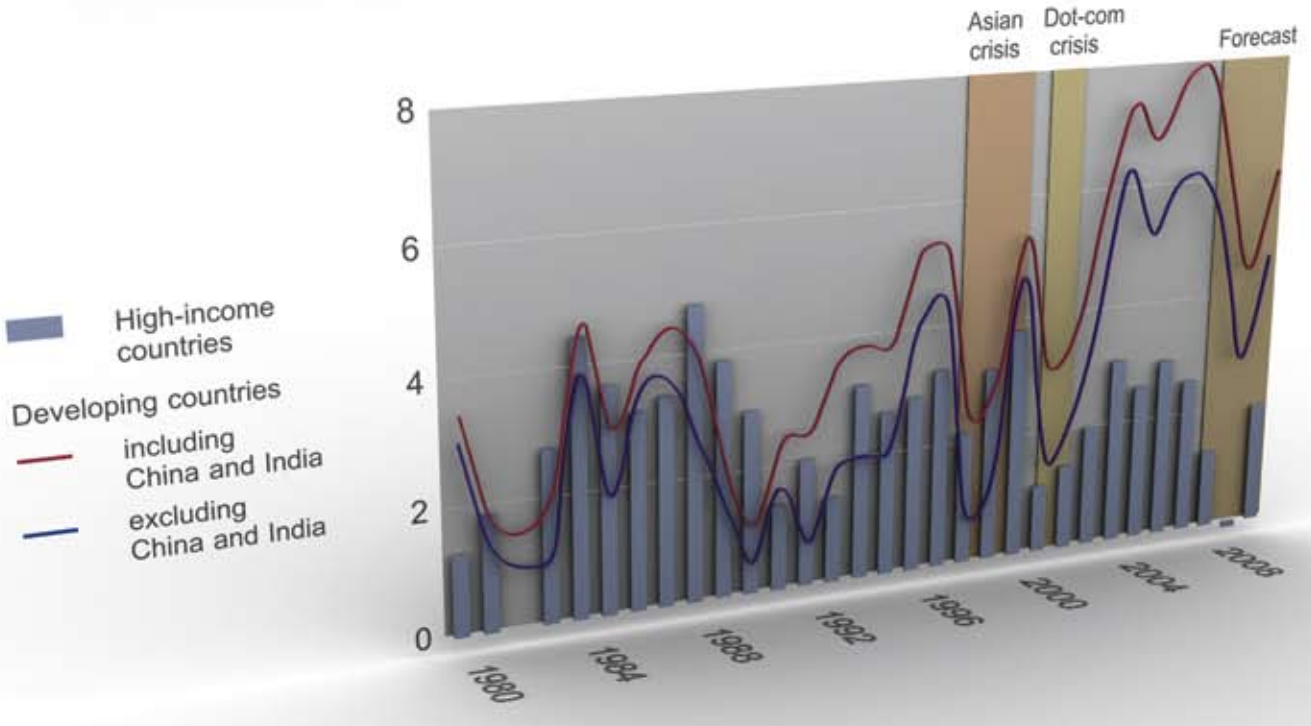
Current macroeconomic indicators are particularly bleak. Global trade is forecast to shrink in 2009 for the first time since 1982, while developing country exports are falling. Central banks have responded to the onset of recession by slashing rates in an ongoing effort to pressure banks to resume lending to consumers and each other and to kick-start their economies with a counter-cyclical stimulus. However, alarmingly, interbank interest rates have become 'detached' from central bank interest rates in some economies, while the risk profile of banks has transformed to verge on ultra-caution. In some countries, interest rates have been cut to historically low levels, but there is still a lack of credit readily available, as banks impose stringent requirements on individual and business borrowers.

Governments now find themselves navigating uncharted territory in how best to respond to the global economic downturn and weaknesses in the financial system. Most governments now recognize the need for some form of regulation of the financial sector to restore confidence and to prevent further systemic failures. The growing impotency of monetary policy has led to widespread agreement on fiscal stimuli and increased state intervention as possible responses. It is unclear whether prior downturns offer helpful comparisons for resolving this crisis (**Insight 1**) with its niche origins in the US property market.

The globalization of the modern financial system and the fact that the US economy accounts for about 30% of the global economy[10] partly explains how a US property crash has become a crisis felt around the world, a situation to which governments are responding with unprecedented coordination. The next section examines the uncertain economic outlook for the future.

Figure 2:

Percentage change in real GDP in high-income and developing countries, 1980-2010



Source: World Bank.

Insight 1: Is This Crisis Any Different?

It can be helpful to compare the current crisis with others. **Figure 2** overleaf compares the impact of two recent economic crises on real GDP (the Asian crisis of the late 1990s and the *dot.com* bust of 2001/2002) with forecasts for 2009-2010.

Several trends are evident from **Figure 2** (overleaf):

- The current crisis originated in the **high-income world,** represented by OECD economies. During previous crises, the growth rate in developing countries has tracked that of high-income countries; however, the developing world is now sustaining a higher growth rate than the OECD area.
- **Current GDP growth in the developing world is higher than in the past,** even compared with the booms preceding the Asian financial crisis or the *dot.com* bust. In the developing world, the current slump in growth has yet to fall back even as far as the peaks of previous economic cycles in either 1997 and 2000.
- The growth period since last slump is around six years, representing **a longer growth period** than before the previous two economic downturns. This suggests that, although the current crisis represents a greater systemic shock, the world economy is still larger and more resilient than at the time of previous downturns, and should be in a better position to withstand such a shock.

Unlike previous crises, this is a crisis that was originally triggered by a collapse in credit markets, rather than equity values (although stock markets around the world have shown major falls). There also seems to have been better coordinated international action to respond to this credit crisis, than on previous occasions. The key to a soft landing will lie in being able to utilize accumulated savings to create new demand, especially in those parts of the world that have benefited from the recent boom. That means tapping the resources of India and China, as well as commodity-rich nations and sovereign wealth funds.

Source: Dr. Tim Kelly, Lead ICT Policy Specialist, infoDev / World Bank. The views expressed herein are those of the author and do not necessarily reflect the views of the World Bank Group or the Governments it represents.

2.2 A Gloomy Economic Outlook[11]

The financial and economic news over the final quarter of 2008 was almost unequivocally bad. This severe global economic downturn stems, of course, from the financial crisis, which erupted in the US around mid-2007. The economic prospects are bleak. But how long will the downturn last?

The OECD projects that twenty-one of the thirty OECD economies will go through an extended recession of a magnitude not witnessed in many countries since the early 1980s. For the OECD area at large, negative output growth for four quarters between mid-2008 and mid-2009 is in prospect. The recovery is likely to be slow and will not start before late 2009. This gloomy economic outlook is the result of tighter financial conditions, subdued income growth and negative wealth effects from lower equity and house prices. Consumption in most economies will be lacklustre. These influences will lead to sharp declines in investment and a massive slowdown in world trade growth.

Inflation is also falling sharply in all OECD countries. So far, 'good' deflation has been evident, with falls in prices due to sharp drops in commodity prices. This increases households' real incomes and purchasing power (compared to 'bad' deflation, where price falls are sustained, reducing households' and firms' capacity to repay their debts). Looking forward, the OECD expects a period of slowing inflation, as global economic activity weakens, putting downward pressure on prices.

Until recently, most commentators argued that demand from the major emerging economies would drive global economic growth, which was the case for much of 2007 and 2008, with the bulk of world trade growth accounted for by the non-OECD area, as well as a growing amount of ICT production. Today, however, the major non-OECD countries of Brazil, the Russian Federation, India and China (the 'BRIC' economies) are experiencing slowing economic activity too, due to difficult international credit conditions, policy tightening, income losses due to lower commodity prices, and weaker demand from OECD countries. The only silver

lining is that the slowdown in growth in these BRIC economies is from high levels. **Insight 2** examines the prospects for ICT-producing economies within the OECD area.

The financial crisis is not the only factor shaping economic prospects. Other important drivers include ongoing adjustments in housing markets in many European economies and negative wealth effects from the steep fall in equity prices. Presently, sizeable fiscal and monetary stimuli and the boost to real household incomes, due to lower commodity prices, are partially offsetting these contractionary forces.

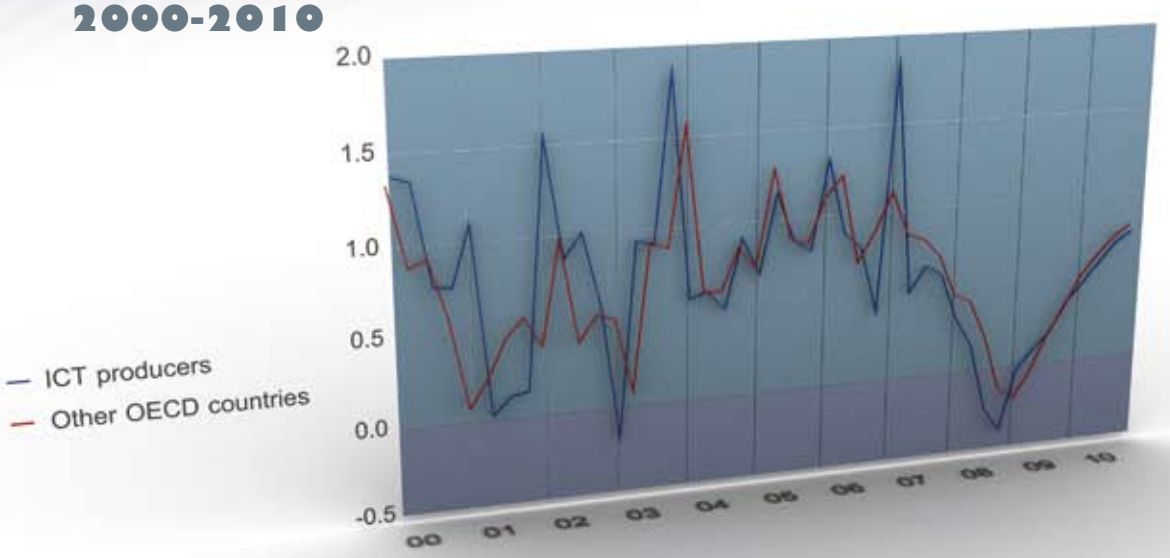
In the current economic climate, the uncertainties attached to forecasts are inevitably large. It is necessary to make assumptions about when conditions in financial markets will normalize. The *OECD Economic Outlook* published in November 2008 assumes that the extreme financial stress since mid-September 2008 will be short-lived and followed by an extended period of financial headwinds through to late 2009, with a gradual normalization thereafter. It is still too early to judge if the worst of the financial stress, stock market meltdown and the credit crunch are behind us.

The risks are many, and for 2009, they are strongly on the downside. The major downside risks include a longer than assumed period before financial conditions normalize, further failures of financial institutions, and the possibility that emerging market economies will be hit harder by the downturn in global trade and a retrenchment of Foreign Direct Investment (FDI). The upside risks are less significant, but adjustment in bank balance sheets may advance more quickly, in response to the unprecedented policy measures introduced, including some since the publication of the *OECD Economic Outlook* at the end of November 2008.

Insight 2: Will ICT-Producing Economies be Spared from the Economic Downturn?

Figure 3:

Real GDP Growth for OECD and ICT-producing Economies, 2000-2010



Source: OECD.

Although the financial crisis is global in scope, it affects countries differently, depending on their sectoral specialization and capacity to withstand shocks (such as cooling house markets and plummeting commodity prices). How will major ICT-producing economies in the OECD fare in these dramatic and uncertain times?

When the *dot.com* bubble burst in 2001, it was widely anticipated that OECD countries with large ICT production sectors – the US, UK, Finland, Korea, Ireland and Japan – would suffer more intensely. Yet, the growth of major OECD ICT-producing countries was broadly the same as in those OECD countries less directly exposed to the burst of the ICT investment bubble.

The short answer is that virtually no economy will be spared from the economic downturn, ICT-producing economies included. Indeed, ICT-producing economies

are potentially more vulnerable to the economic cycle. In **Figure 3**, the peaks and troughs in GDP growth among the major OECD ICT-producing countries are more pronounced than for other OECD countries, partly because investment decisions are sensitive to current and prospective economic conditions.

Over the next two years, the profile of GDP growth in each group of countries should not differ greatly. There are three main reasons for this. Firstly, even though the ICT production sector is large, accounting for some 6% of GDP in the OECD, it is not large enough by itself to have a distinct impact on overall GDP. Secondly, the ICT sector is not itself directly contributing to the economic downturn. Rather, it is one of many sectors that are bearing the negative consequences of tightening credit conditions. Finally, several of the large OECD ICT-producing economies are experiencing downturns in their housing market.

Among the major OECD ICT-producing economies, housing market corrections are large in the US, the UK and Ireland. The coincident economic downturn in ICT-producing countries is not due to, or despite, being large ICT producers, but because they happen to be exposed to corrections in housing markets, which have been underway in some economies since 2006/2007.

There are also several specific factors that will help support growth in the major OECD ICT-producing countries. Firstly, inflation and rates of growth in employee compensation have been lower and are expected to remain so, compared with other OECD countries. This should help the competitive position of these economies. Indeed, ICT-producing economies are expected to experience stronger export market growth than non-ICT producers over the next two years. Another positive fact or is the decision by several governments to design their fiscal stimulus packages in ways that may boost growth in the ICT sector. For instance, the European Commission has suggested countries could increase funding for investment in research and technology and the EU has allocated significant funds for expanding broadband access.

In summary, the major OECD ICT-producing economies are just as likely to be affected by the global economic downturn as other economies. At the same time, the prospect for a more rapid recovery appears favourable, reflecting the responsiveness of these economies to economic shocks.

Source: Jonathan Coppel, Economic Counsellor, and Annabelle Mourougane, Senior Economist, Economics Dept. of the OECD.

Box 1: News and Views from the Corporate Sector

1 Alcatel-Lucent[12]

4 February 2009
12 December 2008

News: Q4 revenues declined 7.5% year-over-year and up 16.9% sequentially on Q3 2008. Yearly revenues for 2008 amounted to EUR 16.98 billion, down 1.1% at constant currency.

Views: "Carrier revenues were impacted by some capex constraints in the fourth quarter, notably in fixed and mobile access. This was partially offset by the strong performance of other carrier segments such as IP routing, submarine and NGNs, the resilience of the enterprise business and solid growth in services" (Ben Verwaayen, CEO).

Strategic Plan: "For the full year 2009, Alcatel-Lucent expects the market for telecommunications equipment and related deployment services to be down 8-12%" (12 December 2008).

2 Cisco Systems[13]

5 November 2008

News: Q1 2009 revenues were US$ 10.3 billion, up from US$ 9.6 billion or +8.1% year-on-year.

Views: "Cisco delivered solid revenue and earnings growth in what is clearly a very challenging global economy… Our strategy and focus for managing the business through this market transition is clear - we will manage and prioritize our resources, invest in innovation, and build stronger relationships with our customers" (John Chambers, Chairman & CEO). "Our revenue guidance for Q2 2009 is for revenue to decrease in the 5-10% range year-over-year… Cisco will use this time as an opportunity to expand our share of our customer spend and we'll be aggressive moving into market adjacencies in the slowdown".

3 Dell[14]

20 November 2008 (for the period including October 2008)

News: Revenue down slightly by 3% as global IT spending slows, but rigorous cost management drove a 11% year-on-year reduction in opex. Profitability increased with improved mix of products and services.

Views: "In a challenging demand environment… Our business model adapts quickly to economic changes, even the kind of significant challenge we saw in the third quarter" (M. Dell, Chairman & CEO).

Dell believes global IT end-user demand will continue to be challenging. The company will continue to focus on improving competitiveness, lowering costs and improving its mix of products and services.

4 Google[15]

23 January 2009

News: Google reported revenues of US$ 5.70 billion for the quarter ended 31 December 2008, up +18% compared to Q4 2007, and up +3% compared to Q3 2008.

Views: "Google performed well in the fourth quarter, despite an increasingly difficult economic environment. Search query growth was strong, revenues were up in most verticals, and we successfully contained costs. It's unclear how long the global downturn will last, but our focus remains on the long term, and we'll continue to invest in Google's core search and ads business as well as in strategic growth areas such as display, mobile and enterprise" (Eric Schmidt, CEO).

5 Intel Corp.[16]

15 January 2009

News: After record Q3 results (US$ 10.2 billion in revenues, up +8% sequentially), Intel announced Q4 revenues of US$ 8.2 billion, 23% down year-on-year.

Views: "While the environment is uncertain... Intel will continue to extend its manufacturing leadership, drive product innovation, develop new markets and implement operating efficiencies that have already taken more than US$ 3 billion out of our ongoing cost structure since 2006" (Paul Otellini, Intel president and CEO).

6 Microsoft Corp.[17]

22 January 2009

News: Microsoft Corp. announced revenue of US$ 16.63 billion for the quarter ended 32 December 2008, a 2% increase over the same period of 2007, with healthy sales of enterprise software & Xbox 360 consoles.

Views: "Economic activity and IT spend slowed beyond our expectation in the quarter and we acted quickly to reduce our cost structure and mitigate its impact. We are planning for economic uncertainty to continue... leading to lower revenue and earnings for the second half" (Chris Liddell, CFO, Microsoft).

7 Motorola[18]

3 February 2009

News: Motorola reported sales of US$ 7.1 billion in Q4 2008, down 26% year-on-year.

Views: "Our balance sheet and liquidity position give us agility and flexibility in today's weakened global economy and turbulent financial markets" (G. Brown, CEO of Broadband Mobility Solutions, 30 October 2008).

"While our strategic intent to separate the company remains intact, we are no longer targeting Q3 2009, due to the macroeconomic environment & stresses in the financial markets" (S. Jha CEO Mobile Devices, 30 October 2008).

8 Orascom Telecommunications[19]

30 September 2008

News: Revenues for the 9 months ending 20 Sept 2008 were US$ 3,566 million, up 12% year-on-year.

Views: "Total revenues from services increased in the nine months of 2008, mainly due to the increase in revenues from telephony services, which were driven
by a strong increase in subscriber numbers".

9 Sun Microsystems[20]

30 October 2008

News: Revenues for Q1 2009 (ending 28 Sept 2008) were US$ 2.99 billion, a decrease of 7.1% compared with US$ 3.22 billion for Q1 2008.

Views: "The economic downturn continued to weigh on our customers, especially those that contribute to our traditional high-end businesses… The market [is] looking to open source innovation to escape proprietary vendor pricing; we believe Sun is well-positioned to weather the downturn and become the biggest beneficiary in the open source revolution in systems and software" (Jonathan Schwartz, CEO).

10 Vodafone[21]

3 February 2009

News: For the quarter ended 31 December 2008, Group revenue increased by +14.3% to GBP 10.47 billion, substantially due to foreign currency benefits, with organic revenue declining by 1.0%.

Views: "Whilst the current economic environment is challenging, pro forma growth remains positive, albeit slower than the previous quarter reflecting the Group's breadth of customer base and geographic diversity. The Group has focused on implementing [its] strategy, with and emphasis on customer value offers, mobile data, enterprise and broadband" (Vittorio Colao, CEO).

Yahoo! Inc.[22]

21 October 2008

News: Q3 2008 revenues were US$ 1,786 m for Q3 2008, up +1% on US$ 1,768 m for Q3 2007.

Views: "As economic conditions and on-line advertising softened in Q3 2008, we remained focused on our 2008 strategy to invest in initiatives that enhance not only our long-term competitiveness, but also our ability to deliver for users and advertisers in this more difficult climate. We have been disciplined about balancing investments with cost management all year, and have now set in motion initiatives to reduce costs and enhance productivity" (Jerry Yang, co-founder and CEO, Yahoo! Inc).

Source: ITU, abridged from corporate results (listed in alphabetical order). Private sector firms are selected on the basis of an interesting range of news and views illustrating trends discussed in this Report.

3.

Pro
for the

ospects and Challenges e Global ICT Industry

Over recent decades, modern ICTs have transformed the way in which we live, work and play. The ICT sector is now a significant sector in its own right, typically accounting for up to 7.5% of GDP worldwide (depending on which sectors and services are included),[23] and an even higher proportion of GDP growth, in addition to its important facilitating role in many other sectors. Historically, the ICT industry have been viewed as long-term growth industries, riding a wave of innovation and technological development implying growth rates significantly above global GDP growth, even during difficult economic times. Now, some analysts question whether this paradigm remains true, noting a growing reliance on (and vulnerability to) consumers (**Insight 3**).

Telecom services remain vital services for consumers and businesses alike. In its Industry Strategy paper on telecommunications, "A defensive sector for defensive times", Deutsche Bank notes that "whilst telecom is not immune to the economic slowdown, it is less exposed than other sectors… [and] the market as a whole".[24] The forecasting firm Ovum has developed a three-part scenario and projects that the most likely scenario for the impact of the financial crisis on the telecoms industry is "a generally mild impact… with growth and spending slowing, but not declining" from mid-2008 throughout 2009, as telecom is now a utility, rather than a luxury. Ovum's pessimistic scenario projects zero growth in capex in 2008/2009, while their optimistic case sees revenue and capex returning to 2007 levels in 2009.[25]

IDC projects an overall reduction of only 1% in growth in global telecom service revenues.[26] As recently as November 2008, Analysys Mason noted that "the consensus among telcos is that the true impact of the economic downturn has yet to materialize".[27]

Insight 3: Challenging Times for the Tech Sector

The old cliché was that the tech sector was a long-term growth industry, riding a wave of convergence and digitization implying growth rates significantly above global GDP growth, even during difficult economic times. While this may have been true historically – the ICT industry weathered the 1987 market shock and 1990-92 recession quite well – it seems less true today. ICT industry growth decreases in the developing and developed worlds roughly match anticipated declines in GDP, and this is occurring across multiple sub-vertical segments within the technology and telecommunication sectors. The industry's post-2001 reliance on consumers as much as on business makes revenues more volatile than in past cycles.

However, the bad news does not stop there, at least for some segments of the industry. While the most pessimistic forecasts for fourth-quarter GDP declines in the United States are 3-5%, and the global contraction is estimated to be around 1-2%, some bellwether tech and telecom companies are pre-announcing revenue shortfalls that are between 20-30% lower than seasonal patterns would suggest. These shortfalls are occurring in several sectors in addition to the notoriously cyclical semiconductor industry: enterprise software, security, telecom infrastructure, and others are feeling the downturn, but magnified by a factor of ten. This phenomenon where technology, media and telecommunication (TMT) companies experience a levered deceleration of revenues is new and management teams are trying to adapt to it quickly.

Source: Paul Lee, Director of Research, Deloitte UK, & Duncan Stewart, Director of Research, Deloitte Canada, Technology, Media & Telecommunications (TMT), Life Sciences & GreenTech, authors of TMT Trends: Predictions at: www.deloitte.com/dtt/research/0,1015,cid%253D108298,00.html.

Pyramid Research projects that the telecom services market will generate US$ 1.4 trillion in 2009, growing by only 1% year-on-year (compared to the 10-11% annual growth rates over recent years) due to "the grim economic outlook and substantial currency fluctuations". Pyramid Research considers that voice services will be hardest hit in 2009, contracting by 3% in 2009 compared with a 6% expansion in 2008. Meanwhile "non-voice mobile applications and broadband Internet access are expected to remain robust", with the data market (both fixed and mobile) reaching US$ 411 billion in 2009, up 12% on 2008.[28]

In IT spending, two leading market research firms recently reduced their IT spending forecasts in mid-October 2008, on the basis that corporate spending and consumer demand may fall. Market analysts Gartner projected that IT spending would fall in Europe, flatten in the US and grow only slowly in emerging markets,[29] while the research firm Forrester predicted several quarters of declines in IT purchases in late 2008 and the first half of 2009.[30] Forrester predicts that global purchases of IT goods and services — and hence IT vendors' revenues — will amount to US$ 1.66 trillion in 2009, down by 3% in 2009 after 8% growth in 2008 "due to recessions in the US and many industrial countries, with currency fluctuations a secondary factor". Forrester considers that IT purchases will recover in 2010.[31]

In November 2008, the market intelligence firm IDC also reduced its forecast for growth in worldwide spending on IT from 5.9% to 2.6% year-on-year in 2009, due to the financial crisis.[32] However, global IT spending will still continue to grow. For example, Business News Americas reports that, among Latin American economies, the Chilean software and IT services industry is expected to be hit hardest by the crisis in 2009, but the sector is still expected to grow by 10% this year.[33]

Many parts of the IT outsourcing industry are based on long-term contracts, so many large companies should remain committed until at least mid-2009 and the full impact of the financial crisis may not be experienced until then. The business sector may be one sector that is most adversely affected. According to research by the T3i Group, revenues for the U.S. business communications system market declined 7% in Q3 2008 to reach US$ 1 billion, compared with Q3 2007 a year ago.

By Q3 2008, year-to-date 2008 U.S. enterprise telephony system revenues were 10% down on the first three quarters of 2007.[34]

The credit crisis may also provoke consolidation among technology companies, as they come under pressure due to late payments and tighter cashflow. Despite this, some key sectors and markets are likely to retain their positive momentum. Outsourcing may see growth, as cost management becomes all-important – outsourcing IT to consultants can help firms avoid adding headcount or investing in new technology. One recent survey found that nearly half of firms are cutting back on their overall IT budgets for 2008, but only a fifth have cut spending on outsourcing IT services.[35] Some sectors of the market remain optimistic about their need to invest in new ICTs – for example, a survey by Financial Insights found that 85% of CIOs of Asian-Pacific banks still expect to invest in technology despite the crisis. Only 15% of CIOs foresaw a reduction in their technology investments.[36]

In an industry driven by innovation and technological change, the financial crisis is likely to disrupt the established order and create new openings for nascent technologies. The experience of previous crises shows that economic crises can create openings for disruptive technologies and small start-ups can prove the most agile in exploiting new opportunities (**Insight** 4), especially where new opportunities can save consumers money. The financial crisis will accelerate the emergence of new, converged services in many markets.

Insight 4: Crises and Creative Destruction

For the ICT industry, experience of previous crises shows that, overall, there is little need to fear the impact financial crises may have, and there are even some reasons to be optimistic. The Asian financial crisis of the late 1990s laid the groundwork for the early development of broadband in that region, while the bursting of the *dot.com* bubble gave telcos the opportunity to embrace the Internet and to reclaim some of the ground they had lost to new market entrants. Broadly speaking, entrants that complemented the operations of the telcos survived – e.g. Amazon.com or Google – but entrants that

competed head-on with telcos – e.g. AOL or DialPad.com – did not fare so well. In the ICT industry, especially in telecoms, deep pockets and steady cash-flow are the keys to long-term success. Financial weakness in the sector creates opportunities for cash-rich telcos to acquire competitors and to purchase distressed assets at depressed prices.

Economic crises create openings for disruptive technologies and, here, small start-ups can prove the most agile in exploiting new opportunities. Google was born in 1998, in the midst of the Asian financial crisis, while Skype was born in 2003, during the *dot.com* slump. Both introduced disruptive technologies – in Internet search and Internet telephony, respectively – and both have thrived, while other competitors have fallen by the wayside. One reason is because they complemented the wider ICT ecosystem, rather than cannibalizing it. Another reason is because they had relatively low start-up and running costs and have been able to take advantage of the falling prices that the financial crises of that time induced – in computer processing power and in bandwidth respectively.

The current financial crisis is likely to follow a similar pattern. In some ways, it will reassert the old order with those ICT companies that have sustainable business models, stable cash-flows and deep pockets being able to regain some of the ground they have lost to new market entrants that are not so financially stable. But it will also create new opportunities for new firms with disruptive technologies to thrive. This will happen where prices are falling and where technology is changing. It might happen, for instance, in markets facilitated by the availability of lower-price, higher performance consumer broadband. Disruptive technologies may also develop where new spectrum is being released, for instance, by the switchover to digital television, or where new technology enables shared use of spectrum, such as in the "white spaces" (guard bands) between TV channels. But new market entry is most likely to happen in the developing world, where growth continues apace for the time being, largely unaffected by the travails afflicting the OECD economies.

Economic crises come and go, but the basic human need to communicate continues unchanged. For this reason, the ICT industry is likely to emerge from the current financial crisis as strong as ever.

Source: Dr. Tim Kelly, Lead ICT Policy Specialist, infoDev / World Bank. The views expressed herein are those of the author and do not necessarily reflect the views of the World Bank Group or the Governments it represents.

4.

Impact o

of the Financial Crisis

4.1 Investment and Financing

One of the more obvious effects of the credit crunch is a reduction in and more expensive credit for investment. A prolonged credit crunch and financial crisis could potentially starve operators of the capital investment needed for upgrades to network infrastructure. Some telecom operators are already experiencing difficulty obtaining financing (e.g., AT&T experienced difficulty selling commercial paper, an unsecured debt instrument for meeting its short-term liabilities in the US in mid-2008). Many network upgrades envisioned for the next two-three years are financed through debt and may stall due to lack of available credit. Further, funding issues are unlikely to be resolved until the banking sector is fully recapitalized.

In some countries, central bank interest rates have been cut to historically low levels, but this is not reflected in rates for interbank and commercial lending and there is still a lack of credit readily available. Exposed banks seeking to revive their balance sheets have often not reduced commercial rates by anywhere near the same amount as the cuts in central rates, while banks' risk profiles have been transformed to veer on the side of ultra-caution, with banks imposing stringent requirements on personal and business borrowers. Firms seeking funding now need proven credentials, sound business plans with a target clientele and early cashflows in the near term, and preferably pre-existing relationships with lenders **(Insight 19)**.

The situation is all the more urgent, given estimates of the investment needed to modernize broadband Internet infrastructure. The global cost of upgrading the Internet to keep pace with demand has been estimated by Nemertes at US$ 137 billion over the next five years, with network operators in North America spending 60-70% less than they should be.[37] Nemertes concluded that demand will exceed total broadband capacity at the access layer of the Internet by 2012, with the situation worse than originally projected in the US. There is already a major shortfall in the

financial investment required to bridge the gap between demand and capacity. Service providers' investment plans currently amount to some US$ 72 billion over 2008-2012. Nemertes estimates that an additional US$ 42-55 billion is needed to upgrade infrastructure and acknowledges "it is clear that a credit crunch puts pressure on telecom companies".[38]

Where credit is available, interest costs have risen sharply. For example, US carrier Sprint Nextel recently renegotiated its debt from its original credit line of US$ 6 billion at the London reference interest rate LIBOR plus 0.75% for a new line of US$ 4 billion at LIBOR plus 3%, depending on the company's debt ratings.[39] Some analysts suggest that operators are under pressure to refinance their debt obligations and/or sell off non-core business.[40] Deutsche Bank estimates that European incumbents alone have some EUR 21 billion of bonds maturing soon in 2009, with a further EUR 26 billion of other financial liabilities, debt which may need to be refinanced over the coming year. The difficulties in the credit market have seen refinancing costs rise sharply, with recent telco debt issuance being secured at spreads of up to 4.75% in late 2008 (**Table 1**),[41] 3-4% higher than the financing available pre-crisis (depending on firms' debt ratings). Where bonds can be refinanced, it is clear that they are incurring higher interest costs.

Deutsche Bank suggests that overall, most telcos still have a low re-financing risk, but smaller players may be squeezed by high leverage. Larger operators, including incumbents, may be able to rely on stand-by facilities and regular revenue from customers to see out the financial crisis. Ovum notes that many telecom service providers are cash-generating and may be less vulnerable to impaired credit markets.[42] Some industry insiders suggest that software services firms may experience more difficulty getting funding than operators, as banks may be more reluctant to make loans to firms comprised of people and intellectual assets, rather than machinery or tangible assets that can be used to underwrite loans.[43]

Table 1: Recent Debt Issuance by Major European Operators

Date	Company	Issuance	Maturity	Coupon	Spread
12 June	Vodafone	EUR 1.25bn	2010	5.88%	0.60%
18 June	BT Group	EUR 1.0 bn	2015	6.50%	1.55%
6 August	Telekom Austria	EUR 200m	2012	6.2% floating	
6 August	Telekom Austria	EUR 100m	2012	6.08% fixed	
11 August	Deutsche Telekom	USD 650m	2013	5.88%	
11 August	Deutsche Telekom	USD 850m	2018	6.75%	
20 August	Swisscom	CHF 475m	2015	4.00%	
28 August	France Telecom	EUR 350m	2018	3.0% index-linked	1.08%
3 September	Deutsche Telekom	EUR 750m	2014	5.88%	1.37%
9 September	KPN	EUR 200m	2015	4.0%	1.25%
9 September	KPN	EUR 850m	2013	6.25%	1.75%
6 November	France Telecom	EUR 115m	2018	3.0%	1.85%
10 November	KPN	EUR 200m	2015	4.0%	1.25%
10 November	France Telecom	GBP 500m	2028	8.13%	4.0%
14 November	Belgacom	EUR 175m	2011	4.13%	2.25%
14 November	Belgacom	EUR 200m	2016	4.38%	3.00%
18 November	Vodafone	GBP 450m	2018	8.13%	4.00%
19 November	Deutsche Telekom	GBP 250m	2028	8.88%	4.75%
16 November	Belgacom	EUR 100m	2013	6.0%	2.1%
17 November	Vodafone	EUR 1.0bn	2013	6.88%	3.50%

Source: Deutsche Bank.

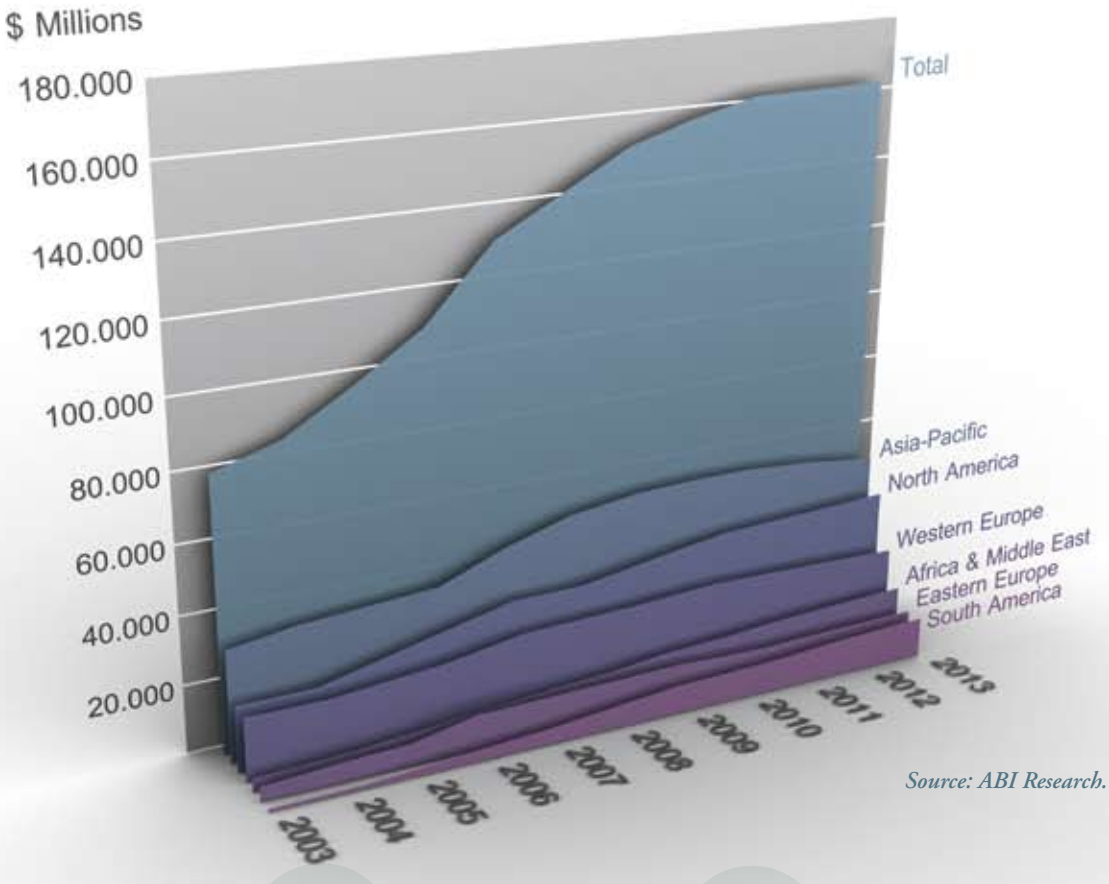
Alternative sources of financing may be needed: as with the banking sector, there may be growing pressure on governments to help finance some NGNs currently being built or planned. Many European governments have advocated the need for IP-based broadband networks, and may experience difficulty allowing them to be postponed, due to the funding problems of hard-pressed commercial operators.

Telecom markets may become characterized by greater State funding – e.g., the Italian Government pledged in September 2008 to invest up to EUR 1 billion in Italy's NGN infrastructure (10% of estimated total cost).[44] In September 2008, the Greek Government announced that it will go ahead with a EUR 2.1 billion plan to build FTTx broadband networks for 2 million homes in the cities of Athens and Thessaloniki with up to 100 Mbps connections,[45] whilst the Australian Government is maintaining its commitment to subsidize some US$ 3 billion[46] of a new US$ 9 billion high-speed National Broadband Network.[47] There is scope for greater government involvement in the financing and roll-out of national backbone infrastructure. Indeed, a new economic recovery plan planned for 2009 by the EU includes an allocated US$ 7.1 billion for the improvement of broadband access and energy links across Europe, especially in underserved areas.[48]

When revenues fall, operators usually cut capex, boosting operating margins and profits. ABI Research forecasts that growth in capex will decelerate. ABI estimates that global capex by telecom carriers stood at US$ 131 billion in 2007. ABI predicts that, despite the worsening credit crisis, mobile carriers will still notch up capex of US$ 142 billion in 2008 (**Figure 4**), 8.3% up year-on-year, but with growth rate in capex reducing to 7% in 2009.[49]

Figure 4:

Slowdown in Telecom Carriers' Capex, 2003-2013



Source: ABI Research.

Mobile operators may enjoy greater flexibility in terms of their capex commitments than fixed operators as capex investments only represent 20-30% of total cost of ownership for mobile operators (although this crucial cost function directly influences 70-80% of opex).[50] Mobile operators have made substantial investments in 3G, but the incremental costs of upgrades (e.g. to HSPA) are low. Equipment price declines and network-sharing could help boost coverage and penetration, with only limited amounts of additional capital needed. The speed, quality and throughput of mobile broadband can all be varied to optimize investment budgets (e.g. Vodafone claims that utilization of its 3G network is only 32% of capacity to date, with significant room for expansion).

Investment in NGNs may be less discretionary for fixed-line operators, however, which are competing with unbundled local loop (ULL) and cable TV operators (and increasingly, mobile broadband) and need to upgrade services to consumers wanting greater capacity at lower prices. Many operators are investing in the roll-out of NGNs (**see Section 5.3**). Universal service obligations may also prevent fixed capex from falling much further. Several carriers (eg. AT&T) have reported cuts in capex of 10-15%, but Informa finds that operators' investment plans have not been 'severely altered' so far, while many operators acknowledge the importance of investment to ensure that quality of service is maintained (**Insight 5**).

Insight 5: Capex is Safe, At Least For Now

In the infrastructure market, there is a widespread fear that vendors will be affected by a slowdown in operator capex. Despite an atmosphere of caution, Informa's conversations with operators suggest that investment plans will not be severely altered and that investment calculations will continue to be made on the basis of expected rates of return. Whilst the cost of capital is expected to rise due to the turmoil in the credit markets, so long as returns are above the weighted average cost of capital, operators will continue to add capacity and coverage to their networks.

Informa's research shows that most operators acknowledge that investment is vital to ensure that network quality is not compromised by congestion. The growth in data traffic thanks to the phenomenal popularity of mobile broadband dongles (or modems) is forcing operators to invest in greater capacity to ensure even basic levels of service. The mobile broadband market has mushroomed to over 30 million connections and Informa forecasts it will grow at more than 50% again in 2009. Quality of service can only be sustained by further investment in capacity.

Yet, capex will not be completely unaffected. Vodafone has cut its capex projection for 2009 by GBP 200 million following a 2.5% drop in forecast revenue for the year ending in March 2009. However, most evidence so far suggests that operators will only cut capex as a last resort to ensure they hit free cashflow guidance figures. Free cashflow is the new metric of choice among investors, whose 'flight to safety' is driven by a preference for strong balance sheets and sufficient cash to permit operational flexibility.

Operators will instead focus their efforts on adopting a more ruthless approach to operational expenses. Advertising and expenses such as travel, training and conference attendance are under threat. More job cuts will follow the job losses at Telekom Austria, Deutsche Telekom and Virgin Media. Network-sharing may increase as operators' inflexible stance on network-sharing is loosened by financial necessity. There will be more pressure on infrastructure players as operators seek lower prices from competing equipment vendors. We believe that there could be a return to vendor-financing deals if operators find themselves struggling to raise capital. This is most likely among greenfield operators who have few cash reserves, and need to finance new network roll-outs. We anticipate seeing a number of high profile operator withdrawals in 2009. Chinese vendors have shown a propensity for such financing deals in the past and may view the current climate as an opportunity to build on the gains they made in 2008.

Source: Thomas Wehmeier, Principal Analyst (Mobile Regions), Informa Telecoms & Media Group.

There is evidence, however, that some operators are cutting investments in network upgrades. For example, Colombian municipal telco ETB expects its capex for next year to amount to US$ 150 million, down from total capex of US$ 160 million in 2008.[51] ETB expects to continue investing in network upgrades for convergent services and will target the high-value corporate segment. Meanwhile, Thailand's largest provincial fixed line telco, TT&T, has suspended a THB50 billion (US$ 1.5 billion) investment plan due to the financial crisis. TT&T is also postponing its 3G investments indefinitely and scaled down its investment plan from THB 2 billion to THB 800 million, after it filed a petition with the Central Bankruptcy Court in April. In the US, Sprint Nextel slashed its wireless capex to US$ 217 million in Q3 2008, compared with US$ 393 million spent in the Q2 2008 and US$ 813 million spent in Q3 2007.[52]

Foreign investment in telecommunications plays a particularly important role in financing the roll-out of infrastructure in developing countries. **Insight 6** considers the impact of the financial crisis on foreign investment in telecommunication infrastructure in developing countries. South-South investment could play an increasingly important role (**Insight 6**).

Insight 6: The Impact of the Crisis on Foreign Investment in Telecommunications

Compared with other infrastructure investments in developing countries, FDI plays a very important role in the case of telecommunications.[53] Privatization and greenfield investments by Trans-National Corporations (TNCs) accounted for 83% of projects with private-sector participation from 1996-2006 (concessions and management contracts made up the rest). Privatization projects were mainly related to fixed-line telephony, while most greenfield projects were associated with mobile telephony. Over this same period, foreign companies invested over US$ 100 billion in telecom projects in developing countries.[54] Reliance on foreign investment is particularly high in Latin America and in Africa.

A relatively small group of TNCs account for the foreign investments (**Table 2**). In Latin America, TNCs are mainly from Spain, Italy and Mexico. In Africa, TNCs originate mainly in France, West Asia and Africa, while in Asia, most of the top investors are of Asian origin. Thus, in both Africa and Asia, South-South investments are significant.

Table 2: Top Six Foreign Investors in Telecommunications Infrastructure, by Host Region, 1996-2006

(Millions of dollars)

Africa			Developing Asia			Latin America and the Caribbean		
Corporation	Home economy	Investment commitments	Corporation	Home economy	Investment commitments	Corporation	Home economy	Investment commitments
Vivendi	France	6 113	Telekom Malaysia	Malaysia	3 575	Telefónica	Spain	24 785
Mobile Telecom-munications Co.	Kuwait	4 989	Khazanah Nasional	Malaysia	2 337	Telecom Italia	Italy	12 189
France Telecom	France	4 945	Telenor	Norway	2 080	América Móvil	Mexico	10 282
MTN Group	South Africa	4 555	Abu Dhabi Group	U.A.E.	1 693	Telmex	Mexico	7 925
Orascom	Egypt	3 777	Singapore Telecom	Singapore	1 369	Portugal Telecom	Portugal	6 650
Vodafone	U.K	3 455	Maxis Communications	Malaysia	999	Cable and Wireless	U.K.	1 449

Source: UNCTAD (2008).

Assessing the impact of the financial crisis on the roll-out of new infrastructure in developing countries is not easy. When the *dot.com* bubble burst in 2000-2001, global telecom-related FDI declined dramatically due to a collapse in cross-border M&As involving firms in developed countries.[55] FDI flows to developing countries were less affected - in fact, in Africa and developing Asia, foreign investment in telecommunications rose over 2001-2006, compared with the preceding five years.

Today, companies are likely to face difficulties in raising the necessary funds to finance their overseas investments. Developed-country markets are more likely to be adversely affected by the credit crunch. If credit continues to remain tight, telecom operators, especially those with high debts, may have to reduce their capital investments. Declining demand among operators for new equipment may result in fewer new telecom projects in 2009. The decline is mostly due to tighter financing – venture capitalists and lending

institutions are now more cautious, with potential negative effects on FDI in telecom. A shortage of lending will make it more difficult to finance large M&As and planned privatizations may be postponed as a result of the crisis.

Conversely, developing countries enjoy strong growth in ICTs, and many telecom operators in these economies may be able to sustain healthy revenue streams despite the credit crunch. The CEO of Ericsson noted on releasing its interim results for Q3 2008: *"Our business in the quarter has not been impacted by the financial turmoil. Our customers are generally financially strong. Networks are loaded and traffic shows strong increase. In the present financial turmoil, it is however hard to predict how operators will act and to what extent consumer telecom spending will be affected"* [56].

The MTN Group (South Africa) has indicated that the African telecom market may not be too adversely affected by the global crisis. The growth potential of mobile phones in many developing countries is likely to spur foreign companies to invest there. MTN's CEO has suggested that *"mobile spending remained 'resilient' in many of MTN's markets and that mobile firms in developing nations may not take a big hit from a global slowdown because wireless communications are viewed as an essential service, not a luxury".*[57] Zain (Kuwait) recently raised US$ 4.5 billion from its owners and is well-placed to invest in smaller companies that may struggle, as credit is in short supply. These companies may be able to strengthen their positions in the African wireless market.

Thus, it is possible that South-South investment in the ICT sector can play an even larger role. TNCs backed by home-country governments with large current account surpluses (such as in the Middle East and China) may be in a better position to seize investment opportunities. The two main Chinese equipment suppliers – Huawei and ZTE – have cited their lower cost structure as an advantage in the financial crisis, which will put pressure on other operators to find lower-cost solutions.[58]

These are still early days, and any prediction as to how the crisis will affect future investment plans is fraught with uncertainty. Investors that are well-endowed with cash may find interesting opportunities as a result of the crisis, but the picture also varies considerably, by country and company.

Source: Science, Technology and ICT Branch, UNCTAD.

4.2 How Will Consumer Demand Respond?

The current economic climate is affecting consumer incomes worldwide, with many jobs under threat as firms cut costs, especially in high-income countries.[59] The OECD projects that the number of unemployed people in OECD countries could rise by 8 million to reach 42 million in the next two years.[60] But how will consumer demand for telecom services respond to falling incomes? And will demand switch between services to different types of services?

Analysys Mason considers that, given falling GDP, increasing inflation, a shrinking enterprise sector and uncertainty in the consumer market, end-user demand is likely to suffer. However, several analysts point out that, during previous downturns, mobile and broadband were niche services, rather than the mass markets they have become today, so trends in demand in response to the crisis may not be well understood.

However, telcos need to be able to understand the spending behavior of consumers in order to weather the recession and design packages that are closely tailored to consumer needs. Research into the income elasticity of demand (a measure of how consumer demand responds to changes in income) offers some insight into how consumer demand may change, in response to changes in income. Studies of the income elasticity of ICTs suggest different patterns of response in consumer demand for developing and developed countries.

In developing countries, consumers' disposable incomes were hit recently by rises in food prices. Older studies suggested that mobile phones were originally considered luxury goods in developing countries, with income elasticity of demand for mobiles at +1.5 for an average developing country with 8% penetration (Waverman, 2005;[61] Milne, 2006[62] for Latin America; and Narayana, 2008[63] for India). On this basis, mobile phone usage might be expected to fall with a reduction in real income. However, as mobile networks have continued to grow in developing countries beyond all expectations, this argument that they are a "luxury good" is now hard to defend and is increasingly rejected. Demand may still continue to grow in developing economies despite falling

incomes, as telecom networks are in early stages and business use is high (Wheatley, 2006).[64]

For developed countries, research suggests that broadband Internet access is inelastic – e.g. Cadman & Dineen (2008)[68] found a long-run income elasticity of demand of +0.78 for broadband in OECD countries, implying that a fall in income would lead consumers to give up their broadband subscriptions or defer connection upgrades. Indeed, there is evidence that the rate of growth of broadband services in the United Kingdom has already tailed off, as demand for new or upgraded connections weakens (**Insight 18**).

Point Topic notes that financial pressures could force some consumers to cancel their broadband subscriptions, if they face falling real incomes. Until now, actual net falls in broadband numbers are virtually unheard of, and consumers have proved very reluctant to give up broadband once they have got it, but that could change. Point Topic notes that the broadband market is too new to have been seriously tested by recession - during the recession of 2001-2003, the broadband market was still small and growing too vigorously to be held back much by economic difficulties.[66]

For countries where data services are popular, data revenues could be adversely impacted by a reduction in consumers' real incomes, a challenge to operators relying on value-added services to compensate for voice revenues threatened by regulatory action on prices. Worldwide, income elasticities are most likely falling over time, as mobile phones and Internet access become basic necessities, rather than luxury goods, leaving the industry in a better position to respond to falling consumer incomes.

More consumers are likely to opt for prepaid and flat-rate packages for telecom services to try and control their expenditure. In Europe, a high proportion of telecom customers are under contracts subject to fixed monthly fees, in contrast to most developing countries, where prepaid has been a major driver of growth in mobile telephony. A growing number of contract customers will migrate to prepaid packages, as this will allow users to reduce their spending using prepaid.

Bald statements about changes in the level of consumer demand mask variations in demand switching between services. The consultancy and research firm Analysys Mason notes the problem of distinguishing new customer additions straight to mobile (*ex ante* service choice) from customers switching from fixed to mobile telephony ('cutting the cord'). The difficulty of distinguishing between new and switched customers makes cross-price elasticities of the change in demand for one service arising from changes in price for another service 'notoriously hard' to interpret for telecoms.[67]

Unemployment may accelerate fixed-mobile substitution, with consumers preferring to switch fully to mobile services. Young people may delay decisions to adopt a fixed broadband or voice line in addition to mobile service (**Analysys Mason, Insight 7**). Notably, Analysys Mason notes that, for voice services, fixed-mobile substitution is a 'one-way street' and fixed operators cannot hope to regain lost customers, when the economy improves. Fixed line operators may be investing their hope in FTTH. Trends in consumer demand therefore have significant implications for telco strategy and pricing, as the next section examines. **Insight 8** identifies the key trends emerging in response to the crisis identified by Deloitte Touche Tohmatsu.

Insight 7: Economic Downturn Exacerbates Fixed-Mobile Substitution

Fixed-mobile substitution (FMS) is a reality that fixed operators have had to adapt to over the last decade, but the economic slowdown will exacerbate it. Differences in the underlying cost structure leave fixed operators at a disadvantage tough economic times. At the wholesale level, costs in fixed operations reflect the underlying cost of the copper loop, resulting in retail pricing structures with a high monthly element and smaller variable element. Fixed providers (whether broadband or PSTN) have to create products offering better value for money for more intensive usage than mobile packages. Unlike their mobile counterparts, fixed service retailers have less room to maneuver in creating affordable low-cost, low-usage products to compete against mobile contracts. The more flexible cost structure of mobile networks means that mobile operators are winning more of the lower-usage end of the fixed services customer base. This has happened in voice, and 2008 has demonstrated that mobile broadband can substitute for light-usage DSL.

Customers whose disposable income is squeezed may stay with fixed services, but will opt for longer contracts to limit outgoings and stabilize expenditure. Recent volatility (e.g. in energy prices and mortgages) has shown that many consumers are willing to sacrifice some gain for greater control over expenditure. Operators able to capitalize on long-term contracts include players with the financial structure that can offset reduced current ARPU against future revenue, and triple-play providers able to offer the most compelling additional value to differentiate.

Consumers whose disposable incomes have been cut through unemployment or debt recall are of more concern for fixed-line players. Unemployment will accelerate households' decisions to give up fixed services, either because they are unaffordable, or because a mobile alternative is cheaper. Job insecurity affects younger people more, so the average age at which youth adopt a fixed line will increase, by up to three years. More worrying for fixed players, FMS is a 'one-way street' – fixed operators do not win back 'lost' customers, once their circumstances improve. This recession is likely to strengthen mobile customer relationships and, in the upturn, mobile networks will grow with consumer needs.

Source: Rupert Wood, Principal Analyst, Analysys Mason.

Insight 8: Key Trends Driven by the Crisis

Pockets of growth within the broader slowdown remain. Certain new computing products (like netbooks), telecom handsets (smartphones), software categories (Software as a Service or SaaS) and media niches (WiFi radio) show positive revenue momentum, even while the broader industry is contracting. While these exceptions may be growing more slowly than expected during better economic times, their growth still impresses. Which trends are we seeing as a direct consequence of the financial crisis?

Being Cheaper Helps: Netbooks are capturing the notebook 'best-seller lists': from nearly zero sales in 2007, as many as 50 million units could be sold in 2009. The main selling point of these less functional devices is that they are roughly half the price of notebooks. Other examples of ICT thriftiness include growth in Software as a Service, increased use of Linux or OSS, and growing use of generic IT solutions.

Free is Even Better: Cash-strapped consumers are not eager to spend on new devices and services. But carriers and service providers see that as an opportunity to build market share and are subsidizing or giving away for free smartphones, netbooks, televisions, PCs, routers and set-top boxes.

This is Probably a Bad Time for New and Expensive Services: Mobile TV did not succeed in setting the world on fire in 2008 – adoption worldwide is still under 1%. The pricing and premiums charged suggest that adoption is unlikely to accelerate. If a service cannot be profitably monetized, 2009 will not be a good year.

Sharing is Good: Whether it is sharing resources through virtualization, cloud computing or a mandated common fibre optic infrastructure, more IT buyers will realize that spreading buying decisions across multiple users is a win-win solution (except vendors, who profit from building redundant infrastructures).

The current economic crisis is momentous, but it will end. At that time, a new and more cost-disciplined ICT and media sector will be positioned to be even more profitable, flexible, and customer-facing. The lessons learned during these hard times are painful ones for the industry to master, but we are already seeing new devices, business models and entrepreneurs emerge.

Source: Paul Lee, Director of Research, Deloitte UK, & Duncan Stewart, Director of Research, Deloitte Canada, Technology, Media & Telecommunications (TMT), Life Sciences and GreenTech, authors of TMT Trends: Predictions at: www.deloitte.com/dtt/research/0,1015,cid%253D108298,00.html.

4.3 Telco Strategies

In the face of more expensive financing and uncertain consumer demand, how will telcos respond? Even before the financial crisis, telcos were already navigating a difficult industry transformation driven by convergence (as examined by the ITU *Future of Voice* workshop). Fixed-mobile substitution (FMS) and the rise of Voice over Internet Protocol (VoIP) telephony are threatening operators' mainstay fixed voice revenues. Many telcos are investing in IP-based networks, data services and content delivery (including broadband Internet and Video on Demand) to bolster flagging revenues. Over the last decade, they have moved from the simple provision of telephony services to triple or quadruple play bundles and converged service offerings. This industry transformation is increasingly calling the role of telcos into question, as telcos reposition themselves within a new multi-media marketplace (**Insight 9**).

Analysys Mason notes that in fixed-mobile substitution, mobile operators' strategy is to displace and win market share from fixed operators, whereas under fixed-mobile convergence (FMC), the strategy for fixed operators is to integrate their service offerings into the market alongside other players.[69]

Insight 9: Telcos in Transformation

The current focus on trends in the telecom market is not just a short-term issue, triggered by the financial crisis - the telecom market has been in slowdown for some time. The real story is the transformation of the role of telcos into a new role in a combined telecom, media and IT industry. Following liberalization, each and every telco is undergoing transformation on multiple levels, from infrastructure through service portfolio into business models. The real question is whether underlying business models are viable or whether new models are needed embracing a wholesale/channel approach to delivering services.

Several potential market scenarios can be envisaged:

- Telcos become marginalized and return to wholesale, away from the customer;
- Telcos move into media services and become key service providers for consumers;
- Telcos move into the IT services/software arena and become core ICT providers to businesses;
- Telcos build on the network-centric nature of their business through data centre service-oriented developments and become the core of the cloud, delivering services through various channels.

It is not a question of whether the telcos can dominate the value chain in these 'new' markets, but whether they can insert themselves into the ecosystem and leverage their network infrastructure and services in a role as real service providers. This does not just involve converging technologies, but a series of interlocking value chains into the new multi-media marketplace. The calamity scenario is that the telco becomes totally disintermediated and left with just the basic connection. Is this truly calamitous? It may result in lower costs of doing business and potentially higher margins.

Source: Chris Lewis, Group Vice President for Telecommunications & Networking, International Region, IDC.

Quote 1: The CEO of Vodafone on Being a Bit Pipe

"A bit pipe, nothing wrong with being a bit pipe if it's an efficient bit pipe... We want to be a smart bit pipe, but 'smart' means that we have few elements of our delivery which are extremely powerful and extremely important for the customers. You're talking about the billing capability; you're talking about the profiling capability; to some extent, you're talking about the location information. These are things that will make the difference between a dumb pipe and a smart pipe. We want to be efficient, given, but we also want to be smart, because that is what will define the value in our business".

Source: Vittorio Colao, CEO, Vodafone, Earnings Announcement, 11 November 2008, transcript at: http://www.123jump.com/market-update/Vodafone-1H-Earnings-Call-Transcript/30340/181

Perhaps the most obvious immediate consequence for telcos is cost control – telcos clearly have to save money to reinforce cash reserves or service existing debt. Telcos with heavy debt burdens as a result of recent expansion may be experiencing difficulties in cash-flow and debt servicing with the rise in financing costs (**Section 4.1**). As noted in **Section 4.1**, some telcos may curtail investments in favour of a more focused approach to investment and cost control. In parallel, telcos can maintain their focus on quality of service and customer satisfaction, as these priorities will stand them in good stead in the upturn.

Quote 2: Remarks of the CEO of O2 Europe Accompanying Q3 Results

"Converged products have driven sales with over 90% of connections in some [UK] regions on combined voice and data packages… We were very pleased that independent [UK] market surveys continued to rate O2 as the fastest broadband with the highest customer satisfaction. The operating environment is more challenging today than at the start of the year, so we will continue to focus on delivering propositions that customers value and which make O2 stand out in the market – to that end we were delighted that The O2 received its 10 millionth visitor in October making it the most popular music venue in the world".

Source: Matthew Key, CEO O2 Europe, "Q3 results for the 3 month period to 30 September 2008", 14 November 2008, available at: http://www.o2.com/latest_pr_14307.asp

In terms of practical pricing strategy, the economic slowdown will increase pressure on operators to reduce prices. Operators have already faced declining prices for telecom services over several years,[70] with regulation, competition, technological change and bundled offers resulting in double-digit price declines over the past 4-5 years. Operators have coped remarkably well with these widespread declines in price by focusing on improving volumes for mature services (e.g. mobile voice) and growth in new and converged services, including fixed broadband and mobile data. Now, operators will face greater competition for more cost-focused customers, further eroding their margins.

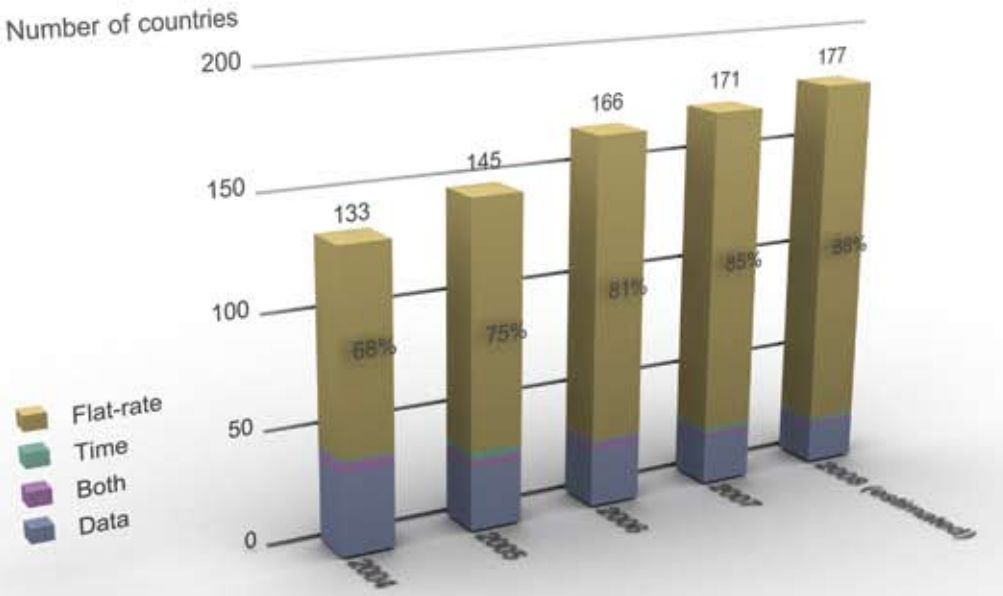
Pressures on operators to sustain price reductions look set to continue. Informa notes that key emerging markets such as the BRIC economies are the battleground for the most intense price competition, as operators fight for market share. Vodafone recently reported a drop of over 50% in the per-minute price of mobile voice calls in India, while falls of over 85% were reported by operators in Indonesia. Informa notes that margins cannot escape unscathed and Vodafone India reported a year-on-year drop of 5% in margins in Q3 2008.[71]

In a recession, flat-rate pricing for telecom services will also become more popular, as it is easy to understand and offers consumers greater 'value for money' and control over expenditure. Historically, operators have tended to be wary of flat-rate pricing, as the uncertainty and risk in traffic volumes remains with providers. However, from the operator's point of view, flat-rate packages can be easy to sell, easy to budget and easy to bill.[72] In an economic downturn, the need to reach as many consumers as possible could drive more operators to adopt flat-rate pricing for mobile and fixed broadband Internet access.

ITU has monitored the price of broadband services for over 200 economies worldwide since 2003. ITU's research shows that flat-rate pricing for mobile and fixed broadband Internet is now available in every region of the world, and more operators look set to adopt it, reinforcing a trend that has existed since at least 2004 (**Figure 5**).

Figure 5:

Growth of Flat-rate Pricing Strategies for Broadband Internet, 2004-2008



Source: ITU

Network-sharing is another major strategy that telecom operators are increasingly likely to adopt. *ITU's Trends in Telecommunication Reform 2008: Six Degrees of Sharing* Report notes that "the single biggest reason to adopt sharing is to lower the cost of deploying broadband networks to achieve widespread and affordable access to ICTs".[73] Deploying mobile base stations or fibre backbone networks to reach rural areas may be uneconomical, if each company builds its own network. Smaller players unable to benefit from economies of scale should not continue building duplicate access networks over the same area. Network-sharing can also help promote access to voice and broadband services, especially in underserved areas.

ITU's Trends in Telecommunication Reform 2008: Six Degrees of Sharing Report explores two main forms of infrastructure-sharing – passive sharing and active sharing.[74] Passive infrastructure-sharing allows operators to share the non-electrical, civil engineering elements of telecom networks (including, for example, ducts, pylons, towers, masts, equipment rooms, power supplies, air conditioning, security systems and rights of way, depending on the kind of network). Active infrastructure-sharing involves sharing the active electronic network elements or 'intelligence in the network' (embodied in base stations and Node Bs for mobile networks and access node switches and management systems for fibre networks). In trying to roll out NGNs during a credit crunch, operators could consider how different types of infrastructure-sharing could help facilitate the realization of their business plans.

The financial crisis could also catalyze consolidation and Mergers & Acquisitions (M&A) within the industry. Pressures on revenues and cashflow could force some companies to seek rescue by angel investors. Meanwhile, in-market consolidation of smaller players and new entrants (carrying higher debt gearing levels and facing financing difficulties) looks more likely. Telcos in industrialized countries seeking to sustain revenue growth may look to emerging markets for promising potential acquisitions to bolster growth. Emerging markets with multiple mobile operators (e.g. Nigeria and Indonesia) are candidates for consolidation and foreign acquisition in 2009. Governments may also be more willing to overlook regulatory obstacles to sustain employment (e.g. TEF/Vivendi's approach to Digital+ in Spain).

However, the credit crunch makes high-value transactions less likely. Deutsche Bank notes the adverse market reaction to Telenor's proposed deal in India and France Telecom's move to acquire TeliaSonera in mid-2008.[75] Sovereign wealth funds may still have substantial funds to invest, despite the liquidity crisis, and Asian and Middle Eastern investors may come to the rescue of some operators in trouble, but even these funds are suffering as recession sets in, with recent declines in oil prices and slowing capital inflows to emerging markets reducing inflows to sovereign wealth funds after August 2008.[76]

4.4 Regulation

The financial crisis also has implications for the regulation of the telecommunication and broadcasting sectors. The origins and spread of the crisis throughout the financial system has even cast the wisdom of an unfettered free market doctrine into doubt and led to calls for stronger regulatory involvement, with many commentators blaming its rapid spread and contagion effects on lack of regulation in the banking sector. In contrast, the telecommunication industry (as well as modern utilities) is now closely regulated, as they have been transformed over recent years by market liberalization, competition and rise of independent regulatory bodies (**Figure 6**).[77] According to ITU data, 152 countries had established a national regulatory authority for their telecommunication/ ICT sector by October 2008.[78]

Figure 6a:

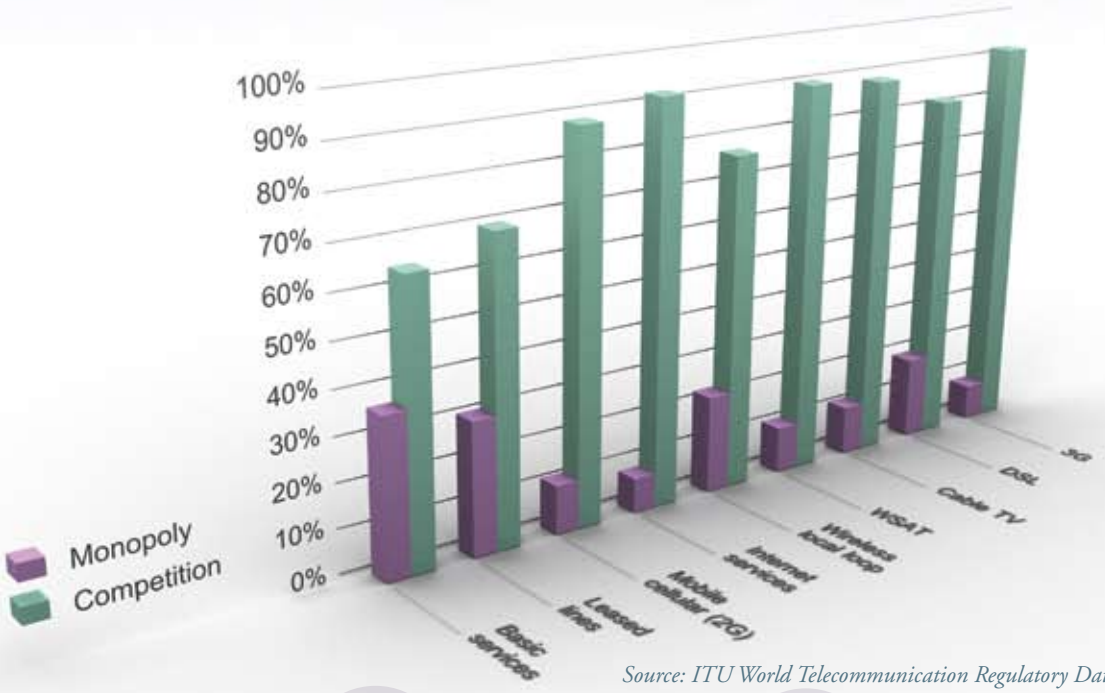
The Rise of Regulation and Competition

Number of countries with regulatory bodies

Source: ITU.

Figure 6b:

Competition in Selected Services, Globally, 2007



Source: ITU World Telecommunication Regulatory Database.

In the face of difficulties in funding and uncertain future consumer demand, operators are likely to push more strongly for regulatory holidays or periods exempt from certain regulations (see **Insight 15,** by the GSMA). The shake-up of the industry and possible mergers among companies may also act indirectly to accelerate the introduction of converged services (e.g. IPTV, video, audio, VoIP, data and mobility).

The transition to NGNs has major long-term implications for the regulation of telecommunication/ICT industry, in terms of competition and pricing, as well as various public policy issues including reliability and security.[79] Current regulation was originally designed to oversee the introduction of competition into the then-existing telecommunication environment, rather than the roll-out of an entirely new

set of networks and services. If telecom companies diversify into content creation, broadcasting or IT service and software arenas to survive (**Insight 9**), the model underlying telecom regulation will need to adapt, with a growing need for unified or converged regulatory bodies with broader mandates.

There are some indications of how future regulatory models might look, in the transition to Next Generation Access (NGA) networks. The European Commission released its draft recommendation on regulated access to NGA networks in September 2008. In this recommendation, the Commission indicated that it expects services over NGA networks to constitute incremental upgrades and not new markets. According to Analysys Mason, this means that it is likely that there will be wholesale broadband access remedies.[80] In contrast to current models of regulation, where LLU is the primary 'passive' remedy, the EC indicated a preference for deeper passive remedies in existing and newly-built ducts. The EC also suggested that any potential foreclosure (e.g., in lack of space in a cabinet or ducts or non-provision of a suitable backhaul product) would be problematic.

The UK regulator, OFCOM, also recently conducted a consultation on "Delivering super-fast broadband in the UK",[81] which underlined the importance of pricing on incentives to invest, competition and consumer demand. OFCOM's current thinking is that price regulation may be disproportionate in the early stages of the transition to NGA.[82] In the meantime, the current uncertainty in the economic climate has imposed some short-term considerations on regulation in the UK (**Insight 10**).

Insight 10: Impact of Current Economic Uncertainty on Regulation in the UK

The past twelve months have seen important developments in the wider communications market. A range of new and innovative services in the market have increased in popularity: e.g., mobile broadband, allowing people to access the Internet on the move. Digital switchover has started in the UK and the convergence of new and traditional media and business models is now upon us.

At the same time, we now face significant economic pressures on a global scale, from which the communication sector is not immune. The uncertainty and volatility of the current climate means that we need to be prepared to act quickly and firmly if any consumer harm arises as a result. The implications of economic pressure will be a common consideration throughout all of our policy work in 2009/10, as we seek to promote a sustainable level of competition in all the markets we regulate to deliver the needs of citizens and consumers. In this challenging economic climate, we will work hard in the coming year to ensure that both citizens' and consumers' interests are promoted and protected. We will help to achieve this by providing opportunities for growth and innovation.

Source: OFCOM draft Annual Plan at: http://www.ofcom.org.uk/consult/condocs/draftap0910/draftap0910.pdf.

In fact, one of the major implications for regulation driven directly by the financial crisis will be the need to promote shared infrastructure to reduce the cost of network roll-out as operators seek to control their operational expenditures. Regulators may opt to *require* infrastructure sharing or merely provide incentives to *encourage* sharing. In addition, regulators can focus on active or passive infrastructure sharing.

Passive infrastructure sharing, focusing on civil engineering network elements, is already included in many countries' existing interconnection regulations. Passive sharing could take the form of introducing new licenses for turn-key mobile mast providers which erect masts that can be shared by multiple mobile operators. Another approach could be to provide subsidies from universal service funds to mobile operators that share their masts with other operators when building out networks in rural areas – an approach that has been pioneered in India. Regulators seeking to promote the rollout of fibre backbone and backhaul networks could authorize market entry by greenfield operators that run wholesale businesses catering to the needs of service providers instead of backbone operators that also provide services to end users. Why? Wholesale fibre backbone operators have every incentive to sell as much capacity as possible and may require little regulatory oversight. Fibre backbone operators which also serve retail customers have incentives to block competitors from gaining access to their networks and are likely to require regulatory intervention in the form of regulated prices and terms and conditions for access.

Historically, many countries have restricted active infrastructure-sharing, focusing on electrical network elements, out of concern that it could enable anti-competitive conduct, such as collusion on prices or service offerings. *ITU's Trends in Telecommunication Reform 2008* Report notes that these concerns remain valid, but that they have to be weighed against advances in technology and applications that enable service providers

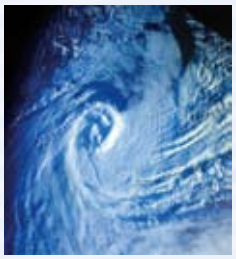
to differentiate their offerings in the market. For example, for some remote areas, the risks of implementing active infrastructure-sharing have to be weighed against the costs of having no services at all.[83] Regulators can consider allowing active infrastructure-sharing for a limited time, until demand grows to support multiple network operators.

Countries seeking to address the economic downturn by introducing financial stimulus packages that fund broadband network investments could also require these networks to be shared. Not only will this bring down costs for deploying networks, it will also allow more efficient use of government funds. Indeed, infrastructure sharing looks set to become an integral part of the changing regulatory environment in order to promote widespread and low-cost broadband access.

4.5 Eco-ICTs

A group of technologies that has generated considerable excitement recently are eco-ICTs or energy-efficient ICTs. Eco-ICTs are vitally important for the future of the planet and the transition to a low-carbon economy. Despite the major anticipated advances in the energy efficiency of products, the ICT sector's own carbon footprint – currently 2% of total global emissions overall – is expected to show an annual growth rate of 6%, and double by 2020, due to growing technology take-up worldwide.

However, ICTs could also facilitate a global reduction in carbon emissions by up to 15% of total emissions by 2020, or 7.8GtCO2 emissions through virtualization and telepresence, as well as the use of more energy-efficient ICTs.[84] Reducing the overall use of the Internet-related



technologies, such as server farms (e.g., by turning them off when they are not in use) and/or using virtualization technologies where appropriate (e.g. replacing servers with virtual machines) can reduce the demand for electricity.[85] The benefits of eco-ICTs include major long-term externalities to the planet and reduced medium-term costs, in terms of energy needs and carbon footprint. They can also enhance firms' reputations and standing with their clients, especially when certified by compliance processes.

The financial crisis could harm the development and sales of eco-ICTs, because reduced investment in Research & Development (R&D) makes it more difficult to develop and bring energy-efficient ICTs to market, as well as alternative cleaner energy sources. Eco-ICT solutions may also prove more expensive and need significant upfront investments. Technology incubators have to recover their R&D costs and may exploit a 'clean and green premium' on eco-ICTs, in consumers' willingness to pay more for energy-efficient technologies. Hopefully, R&D incentives will be included in economic stimulus packages.

But eco-ICTs may also be how companies survive the financial crisis, because they help firms cut immediate and medium-term running costs and cost-efficiency is a critical factor determining whether firms survive a tough economic recession. Demand for cost-saving, energy-efficient ICTs could help firms in many different sectors cut power bills (**Insight 11**) and staff travel costs to weather the economic storm. However, the deployment of eco-ICTs typically costs additional money in upfront capital investment, but cost savings may only be realized two-three years later. The crux of the problem is that the crisis tends to focus people's minds on immediate costs. In times of recession, firms need to save money immediately. More expensive energy-efficient investments may be out, while cheaper solutions may be more popular (usually dirty technologies). Companies may not be looking to invest in eco-ICTs during a recession, as they may be looking to cut costs with immediate cost savings.

The recession may also harm investment in R&D expenditures. Start-ups may face greater difficulties in getting funding for developing

eco-ICTs and other green technologies. In terms of investments, investments are likely to be smaller and venture capital trusts may look to take reduced risks. Compliance and certification programmes may also be costly – certification as environmentally-friendly technology takes time, money and paperwork. Certification has to add sufficient value and credibility with customers for companies to be interested in undergoing compliance procedures.

Despite these difficulties, for firms able to take a more long-term view, eco-ICTs are a worthwhile investment in the technologies of tomorrow. For example, Sun Microsystems claims that its UltraSPARC T2-based system consumes less power than other current processors in its class [86] and can replace four or more conventional X86 servers for certain applications. Server consolidation solutions and virtualization – having one physical piece of hardware doing the job done previously by many others – can help reduce energy and running costs significantly. For any firm taking a sensible long-term outlook in its business plan, investing in similar eco-IT solutions could give them a genuine competitive advantage over the long-term.

Business executives may talk about Returns On Investment (ROI) on eco-ICT investment, but ultimately, the future of eco-ICTs depends on whether they are viewed as a luxury or essential necessity. In tomorrow's competitive landscape, firms may not be able to do without eco-ICT solutions and the critical advantages they confer over competitors.

Insight 11: Saving Money is as Important as Saving the Planet

GreenTech was the success stock market story of 2007, but it has been adversely affected during the downturn with cancelled plants, inventory overcapacity and stock valuations down 70%. Corporate social consciences may be the first casualty of the downturn.

Some sub-sectors within green technology are proving counter-cyclical. The SmartGrid suite of solutions is attracting attention and revenues: not only can a more efficient electricity grid save the producers and consumers of energy a great deal of money, governments are listing SmartGrid investments as favored recipients of stimulatory infrastructure spending. Further, common sense IT solutions (such as tuning the cooling of data centres to more cost-effective levels) are available to all and are starting to be applied as part of cost-cutting measures. Solutions for "making the most of what you have" – for example, telecom companies making better use of customer data – are also starting to be widely applied.

Source: Paul Lee, Director of Research, Deloitte UK, & Duncan Stewart, Director of Research, Deloitte Canada, Technology, Media & Telecommunications (TMT), Life Sciences and GreenTech, authors of Deloitte's TMT Trends: Predictions, available at: www.deloitte.com/dtt/research/0,1015,cid%253D108298,00.html.

4.6 WSIS Targets and Connecting the Next Billion

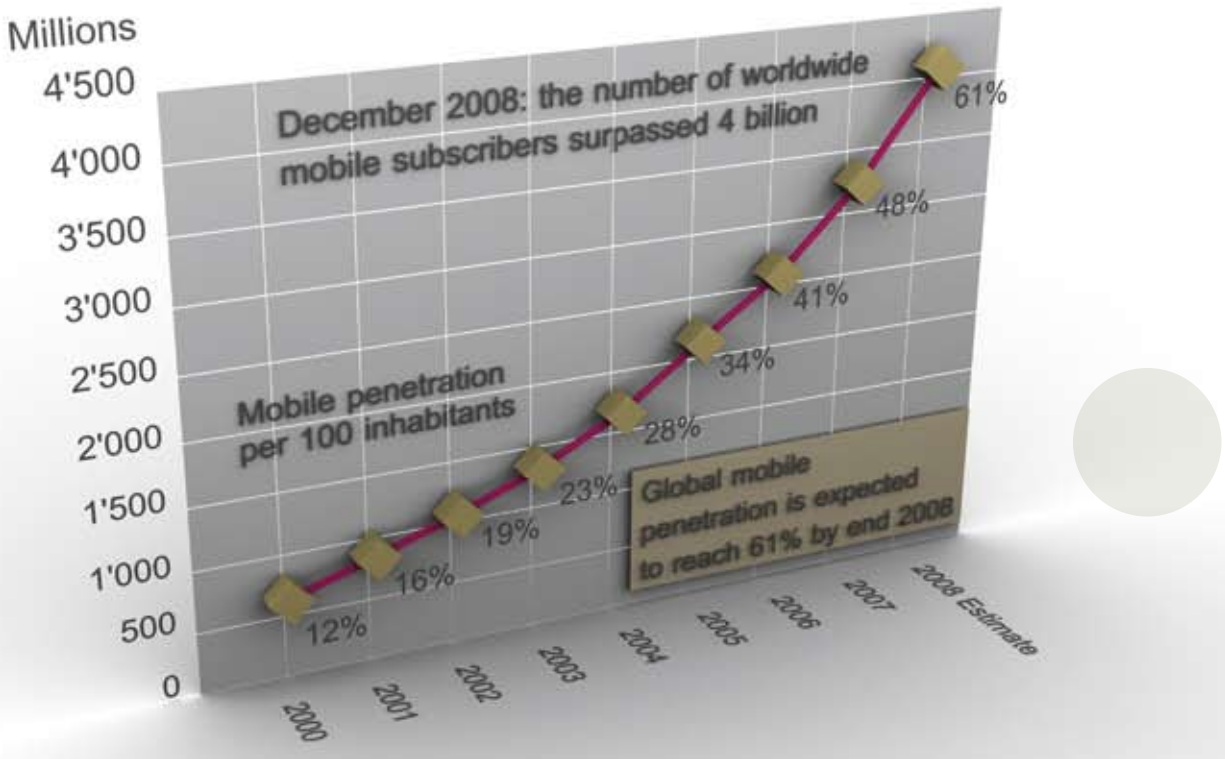
Over recent decades, the rise of the Internet and development of new and advanced ICTs have transformed the way in which we live. The rise of online networked communities is changing the way we interact, while information and knowledge are increasingly used to generate greater wealth, innovation and jobs in the dawning 'information economy'. The ability to use ICTs is now a key skill boosting people's employability and standard of living in many countries today.

The UN convened the World Summit on the Information Society (WSIS) in response to rising awareness of the power of ICTs to transform society and growing concerns that developing countries should not be excluded from the new Information Society. At the WSIS, leaders from every country recognized the fundamental role that ICTs play in promoting economic growth and social and cultural development.[87] They also agreed a set of WSIS targets for connecting villages, educational and healthcare establishments, libraries and government departments. At the end of 2008, WSIS target (j) was close to being achieved – more than half the world's inhabitants look set to have access to ICTs through access to a mobile phone. The financial crisis threatens progress towards the achievement of the WSIS targets , if government budgets for public IT facilities are cut.

However, mobile telephony remains the communication technology with the single greatest promise to connect more people and transform their lives, due to its massive popularity in both developed and developing countries. Between 2000-2008, annual growth in mobile cellular subscriptions averaged 24%. According to ITU statistics, there were 4 billion mobile subscriptions worldwide and mobile penetration around 61% by the end of 2008, equivalent to every second person having a mobile subscription (**Figure** 7).[88]

Figure 7:

Growth in Worldwide Mobile Subscribers, 2000-2008



Source: ITU World Telecommunication/ICT Indicators (WTI) database.

Besides providing communication services to remote areas, mobile applications have enabled the spread of innovations such as m-commerce, pricing information for fishermen and rural farmers and mobile payments for services and remittances. Similarly, broadband technologies can help overcome many development challenges faced by developing countries with a range of valuable online services in areas such as e-government, e-education and e-health.

The issue of the digital divide continues to provoke intense debate, but it is unlikely to diminish anytime soon, as it reflects underlying disparities in wealth distribution.[89] Further, the digital divide is taking on new aspects, as dozens of new ICT services and applications are rolled out rapidly. While many developing countries (e.g. Indonesia, the Maldives, the Philippines and Sri Lanka) have launched 3G mobile broadband networks, the vast majority of broadband subscribers remain concentrated in the developed world. It is vital to ensure that these new ICTs do not reinforce existing divisions between information-rich countries and citizens and the information-poor in the new knowledge society. Indeed, investing in high-quality, affordable information infrastructure, education and knowledge may be the best way to innovate out of this crisis, especially for developing countries. Investing in broader access to knowledge becomes even more important during times of crisis, rather than less so.

Technologies

5.1 Mobile Telephony

The widespread expectation among many industry analysts is that the full impact of the crisis on mobile telephony has not yet materialized. Worldwide, the total number of mobile subscribers grew by nearly 650 million to reach nearly 4 billion subscribers in December 2008 (**Figure** 7) with the total market growing by 19% or one fifth over 2008, driven mostly by gains in developing countries.

Now, however, new risks to consumer spending and mobile revenues are emerging (**Insight 12**), despite the status of mobile service as a basic necessity. Many analysts distinguish between the impact of the crisis on mobile markets in developed and developing countries (although in terms of their structural characteristics, this distinction is rapidly losing value – according to Informa, "they have emerged"[90]).

Growth in developing markets (in terms of subscriber numbers, IT spending and investment) is expected to slow, but not decline. There is little evidence of any impact of the financial crisis in Q3 2008 business results (**Insights 13 and 14**), while Informa expects the full intensity of the downturn to show up in fourth-quarter results (**Insight 12**). Some analysts note that threats to capex and investment in telecom networks have so far been limited mainly to developed countries. These threats could spread to developing countries, especially those reliant on FDI from developed nations with operators controlled by European or North American carriers, but there is so far little evidence of this (**Insight 14**). Overall, the consensus is that growth in developing countries will continue, albeit somewhat more slowly, for the foreseeable future.

Developing countries typically already have high prepaid bases at around 60-85% of the subscriber base, as prepaid telephony has been a key driver of growth. Prepaid has the vital advantages that it gives consumers control over their expenditure, while operators take money upfront and are not advancing credit to customers. In order to retain customers in a recession, operators can extend the length of prepaid terms, so users have longer periods of time without making a call before facing deactivation.[91]

Insight 12: Trends In Mobile Business

In the current climate, Informa foresees the following trends in mobile business:

- A reduction in loyalty and increased churn, as consumers search for bargains;
- Pressure on consumers to restrain mobile spending, resulting in reduced usage and revenues;
- Consumers defer handset upgrades for reduced tariffs and shorter, low-value contracts;
- A polarization of handset sales between affordable low-end devices and high-end models, at the expense of mass-market feature-phone sales;
- Growth in SIM-only market;
- Acceleration of FMS, with consumers choosing mobile over fixed voice services;
- Continued growth in HSPA-enabled devices as a cheaper, mobile alternative to fixed broadband.

The ways in which operators successfully respond and react to these trends will determine their success in navigating the economic downturn. Operators will have to reduce the costs of acquiring and retaining subscribers. We expect the full intensity of the downturn to show up fully in fourth-quarter numbers. Our early analysis suggests that global Q3 2008 net additions exceeded Q3 2007 by nearly 10 million subscriptions. Nevertheless, a slowing of growth is being experienced in some markets – e.g., in Pakistan and Bangladesh, where the effects of the economic crisis have been felt earlier than other markets, net additions in Q3 2008 were respectively 60% and 50% lower than in Q3 2007.

Source: Thomas Wehmeier, Principal Analyst (Mobile Regions), Informa Telecoms & Media Group.

Insight 13: Outlook for The Mobile World

As the mobile industry passes its four billionth customer, none of the Q3 reports from industry leaders contained much to alarm or alert us to any new, unwelcome developments. In Europe, Vodafone and France Telecom have been warning of slower revenue growth for several quarters, mainly due to regulatory intervention and growing competition. In North America, usage rates remained high in Q3 and the slow path to 100% penetration continues. AT&T guided analysts towards lower profits in Q4, mainly due to the near US$ 400 subsidy for every iPhone sold. In Latin America, neither America Movil nor Telefónica saw much cause for concern, while in Africa and Asia, growth continues at record levels.

According to The Mobile World Database, Q3 2008 saw 170 million new connections, taking global mobile subscribers to 3.84 billion at 30 September 2008. Q3 growth is equivalent to 4.6% and while Q3 2008 did not match Q2 2008's exceptional total of 177 million new connections, Q3 was the fourth-best quarter ever. These are extraordinary numbers, but can this pace of growth be maintained? The commentaries accompanying September 2008 numbers were coloured by managers' experience of recent trading conditions: there were few hints of impending catastrophe; indeed, some October 2008 data argues the opposite.

Much of this growth comes from the developing world. In September 2008, India became the first mobile market to add more than 10 million customers in one month, before beating its own record in October 2008 with 10.4 million additions. There is no visible reduction in the phenomenal growth of the Indian mobile market due to the financial crisis. In India, and much of the developing world, telecoms (especially mobile) play an increasingly central role in the economy. The unconnected have seen the advantages of connectivity and, if they can, they are connecting. However, the Average Revenue Per User (ARPU) of these latest customers is almost invariably lower. For every customer that Vodafone loses through redundancy in the UK, it will need to connect ten in India to maintain, let alone grow, its overall revenues.

Source: John Tysoe, Founder & Principal Analyst, The Mobile World, www.themobileworld.com.

Insight 14: Limited Impact on Mobile Communications in Developing Countries

By the end of 2008, the economic crisis had yet to impact growth in mobile in the largest developing country markets. The tightening of credit has threatened capex and investment in telecom networks, but this impact is so far limited mainly to developed countries. It might spread to developing countries, especially those reliant on FDI from developed nations for financing network roll-out. Developing country mobile operators controlled by European or North American carriers could be most affected. However, the overall outlook for developing countries is for continuing strong demand for mobile services.

According to the latest data, growth continues unabated in the largest developing mobile markets. The world's biggest mobile operator, China Mobile, added 74 million mobile subscribers in the year to October 2008[92] (compared with 'only' 55 million from January-October 2007). In India, which surpassed the US in 2008 to become the world's second-largest mobile market, 10.4 million subscribers were added in October 2008, compared to 10.1 million in September 2008.[93] In Nigeria, the number of new mobile subscribers has increased every quarter to September 2008,[94] while Brazil added four million mobile subscribers in October 2008, over twice as many as in October 2007.[95]

In some respects, the economic crisis could not have come at a better time for developing countries in respect to mobile communications. Rapid growth has dramatically increased the penetration of mobile phones, even in the poorest countries. Towards the end of 2008, almost one out of every two persons in developing countries already had a mobile phone. Less than a dozen developing nations have a mobile penetration of less than ten (compared to some two dozen where penetration is already over 100).

In most of the developing countries with a mobile penetration less than ten, restrictive government telecommunications policies cause more harm than any economic crisis could. Therefore, a key

challenge during this economic crisis will be as much about sustaining those with mobile phones as trying to ensure that infrastructure roll-out continues to pick up new subscribers.

The economic crisis could affect mobile subscribers in developing countries, if people lose their jobs or see their incomes cut. However, once a user gets a mobile phone, it is difficult to give up, and in many countries, mobiles have become a necessity.[96] Mobiles have largely replaced fixed lines for voice communications in many developing nations.[97] Therefore, other ICT services are likely to be dropped, with mobile only being discontinued as a last resort.

Developing countries are home to the so-called "next billion mobile subscribers"[98] so it makes sound financial sense to support the mobile sector. Manufacturers and strategic investors are not likely to slash investment in a market with such strong growth potential and untapped demand. In addition, mobile communications drives economic growth in developing countries by creating jobs and facilitating business[99] and can thus help countries overcome the impact of the crisis on other sectors.

Governments can facilitate mobile phone ownership and continued infrastructure roll-out by enhancing competition, minimizing taxes and other fees on mobile operators and making wireless spectrum readily available. A fall in investment from developed countries can be mitigated by greater 'South-South' investment, domestic investment, multilateral assistance or government support. The real concern is that, in times of panic, the risks associated with infrastructure investment are overestimated and credit dries up. It would be irrational to divert investment, since mobile is a healthy sector that can help sustain economic growth.

Source: Michael Minges, Senior Market Analyst, TMG Inc.

In developed countries, where the effects of the economic downturn have been felt first, the effects of the crisis are more complex. Mobile prices and revenues were already under pressure in Europe, due to regulatory changes affecting mobile termination rates, roaming changes and competition. Further price falls seem likely, driven by weakening consumer demand. There is some evidence that consumers are already postponing plans to upgrade their mobile phone and have become more cost-conscious when making calls – the CEO of O2 Europe has noted that customers are increasingly opting not to upgrade their phones.[100] The adoption of new devices is likely to slow.

Mobile broadband and mobile broadband modems/dongles (including embedded devices) are still likely to grow strongly over the next year. Mobile broadband is now enjoying dynamic take-up. Informa estimates that there are now 30 million mobile broadband connections globally (**Insight 5**). In several major European markets, as many as 15-30% of broadband subscriptions are now over cellular networks, up from nearly zero a year ago (including Austria, Ireland and Sweden).[101] Mobile broadband poses a growing competitive threat to DSL.[102]

There is likely to be greater migration from contract to prepaid, to give consumers greater control over their spending (reinforcing the slowdown in handset upgrades, which mostly originate with high-value contract customers). Consumers are likely to want flat-rate packages, as another way of controlling expenditure. Analysys Mason notes that one of the key success factors for the rapid take-up of HSPA has been the introduction of flat-rate pricing with either unlimited usage or very large inclusive data bundles.[103] This may not prove altogether popular with operators – for example, in Sweden, where HSPA broadband adoption has been very successful, Telia has announced that it is reviewing its flat-rate pricing approach "otherwise, it will be difficult to run this business".[104]

Operators will find it harder to promote value-added services (VAS) to wary consumers and the adoption of new services (such as mobile TV) will certainly be impacted. Overall, operators will have to work harder to sell VAS to customers and focusing more on soft aspects, such as customer support services and quality of service.

Ultimately, however, mobile telephony has now become a basic service and massive global market in its own right, besides the economic growth it facilitates in other economic sectors (**Insight 15**). With its strong growth potential, mobile telephony can help facilitate economic recovery.

Insight 15: How Mobile Investment Can Lead the World out of Financial Crisis

ICT investment has proved an effective stimulus to broader economic growth. Consider the mobile industry's ability to drive economic growth in times of economic uncertainty - research proves that the mobile industry has a positive impact driving GDP and economic growth.[105] The industry occupies a unique place at the crossroads of high-tech investment, productivity improvement and social policy in terms of the digital divide. Mobile operators are looking to invest many hundreds of billions of Euros in next-generation mobile technologies, which could help reverse the economic slowdown.

The GSMA considers that the industry also faces significant challenges to its ability to invest:

- The financial crisis has boosted the cost of capital for the mobile industry, which is one of the more capital-intensive industries.[106] With the prospect of recession, revenue assumptions will be downgraded, and marginal investments may be postponed.
- Regulation in some regions is creating an additional and significant burden for the industry.
- Government agendas are now dominated by the calls for help from distressed industries. Mobile has a clear opportunity to play a major role in supporting accelerated growth, though a partnership between private investment and supportive regulation and industrial policy. Governments need to balance their efforts in supporting ailing industries with encouraging "solution" industries.

With these challenges as a back-drop, the mobile industry stands ready to invest in enabling infrastructure that can help drive economic growth in times of crisis. To ensure this investment is realized, the GSMA considers that governments can:

- Release harmonized digital dividend spectrum in a way that encourages infrastructure investment rather than seeks to generate windfall gains;
- Cut ICT specific taxes and remove duty barriers;
- Delay further price regulation in mobile, particularly retail intervention that diverts revenue away from the industry and negatively impacts business plans;
- Remove spectrum bottlenecks and make available UHF spectrum and refarming of 2G for broadband as soon as possible;
- Release USO funds back to the ICT sector, where they exist;
- Allow for commercial deals for infrastructure sharing; and
- Streamline government interfaces with mobile investors and appoint government champions of industry to coordinate infrastructure, power, licensing, planning, etc.

Source: Isabelle Mauro, Head of External Affairs, and Gabriel Solomon, Senior Vice President, GSMA.

5.2 WiMAX and Long Term Evolution (LTE)

2008 started as a promising year for WiMAX. According to Maravedis, BWA/WiMAX subscribers reached 2.68 million in Q3 2008. Meanwhile, the WiMAX Forum estimates that 407 WiMAX networks have been launched to date (**Insight 17**).

Spending on mobile WiMAX overtook fixed WiMAX spending in Q1 2008, with mobile WiMAX now accounting for nearly three-quarters of global sales of WiMAX equipment.[108] Maravedis notes that gobal service revenues growth is losing pace as WiMAX operators experience a slowing of WiMAX adoption and in mobile WiMAX, both vendors (e.g. Telsima) and leading WiMAX operators (e,g. Tata) are struggling to fund their WiMAX plans.

As with mobile, developing countries are driving growth in WiMAX. Infonetics considers that, with less cash available for network roll-out and possibly less spectrum auctioned until the current financial crisis passes, WiMAX deployment will be inhibited over the next year – the global recession may cause some consumers and enterprises to postpone WiMAX adoption, but demand for broadband services continues to grow.[109]

Infonetics estimates that global sales of fixed and mobile WiMAX equipment, as well as phones/ Ultra Mobile PCs, fell by 21% to $245m in Q3 2008, compared to Q2 2008.[110] WiMAX sales may continue to reduce throughout 2009, due to the recession. Infonetics expects revenue growth to return to the overall market for WiMAX in 2010, with growth driven by mobile WiMAX, as a growing number of WiMAX networks are rolled out on 802.16e, even if initial services are fixed CPE-based broadband.

The number of worldwide fixed and mobile WiMAX subscribers is expected to top 76 million in 2011 as demand will be sustained throughout the recession, albeit with slower growth rates.[111] Asia-Pacific accounts for two-thirds of the world mobile WiMAX subscribers in 2008 driven by South Korea, India and Pakistan.

Maravedis notes that, although Sprint and Clearwire have the clearest mobile WiMAX agenda in the US, they are not the only carriers investing in WiMAX. Carriers feel that expansion into specialized niches, especially business-to-business sales coupled with strong service models, integrated back-office systems, and additional service bundles, provide a powerful proposition to customers, even with fixed/portable wireless plays. Maravedis notes that the early impact of the financial crisis has already affected smaller suppliers in the WiMAX ecosystem, but they do not yet expect the financial crisis to result in a major shakeout of the industry (**Insight 16**).

In Q3 2008, Alvarion enjoyed its best-ever quarter for WiMAX revenue and overtook Alcatel-Lucent and Motorola to become the leader in the mobile WiMAX market – Infonetics estimates that the three revenue leaders now account for over 60% of global mobile WiMAX revenue.[112] Alvarion, Alcatel-Lucent, Motorola, and Samsung together have nearly three-quarters of all mobile WiMAX customers. In the fixed WiMAX segment, Telsima and Airspan lead the market in Q3 2008.

ABI Research notes that eighteen operators have already announced LTE deployments (mostly in the 2011-2012 timeframe) and concludes "the tough economy does not seem to have dampened their enthusiasm". Verizon has even brought its LTE deployment timetable forward, from 2010 to 2009. ABI Research forecasts that by 2013, operators will have spent over US$ 8.6 billion on LTE base station infrastructure.[113]

Insight 16: How Does the Crisis Impact WiMAX and LTE Ecosystems?

The early impact of the financial crisis has already affected smaller suppliers in the WiMAX ecosystem. Several suppliers of equipment have reported belt-tightening measures - for example, Alvarion has stated that they have taken additional measures to anticipate potential slowing demand, while Aperto and Redline have reorganized and cut expenditures.

A slew of tier one suppliers have announced projected slowing of demand for handsets and infrastructure throughout 2009. Nortel faces gloomy prospects that require employee cutbacks and potential dissolution of the company. Nokia has reported lower sales expectations for handsets and network infrastructure[114] and reduced its Q4 sales forecast by 6%, in expectation of a slump in the global handset market and expects the mobile and fixed infrastructure markets to be affected by the crisis. However, we do not yet expect the financial crisis to result in a major shake-out of the industry.

At a recent financial industry event in New York for venture capitalists, start-up companies were warned that they must quickly become cashflow-positive, as fresh funding would be hard to come by. Other industry players have suggested that, due to the rapid pay-back on WiMAX greenfield deployments, sufficient funding for continued growth will be forthcoming.

In general, economic downturns favor incumbent revenue flows. However, offsetting the importance of incumbent revenue is a shift to more efficient competitive networks characterized by 3.5G and WiMAX. The impact of the economic crisis is being felt in waning consumer demand, which is likely to impact subscriber growth and consumption habits. As governments implement unprecedented stimulus, we remain guarded in our near-term forecasts for the industry.

Source: Robert Syupta, Senior Analyst & Partner Maravedis.

Insight 17: Growth Despite Adversity - Limited Impact on WiMAX Network Deployments

From 2002 to 2007, the WiMAX Forum estimates that 186 commercial WiMAX networks launched services. 2008 was a fruitful year for the WiMAX industry; more than 200 WiMAX networks deployed and launched commercial services. Since the advent of the global financial crisis, many have questioned the extent of the damage to WiMAX's future. While the WiMAX industry anticipates a slowdown in general, WiMAX Forum still believes that at least 100 more WiMAX operators will launch commercial services in 2009. This number was expected to be higher; however, the market turmoil caused investors to become more cautious and focus on tighter risk management.

Despite a tightening in investment, companies with sound business models and proven technologies, such as WiMAX, will still obtain funding during this challenging time. Developing economies, such as India and Brazil, still seek to bridge the digital divide and have accelerated spectrum auctions to enable operators to deploy Mobile WiMAX networks. And despite uncertainties among device vendors, many, such as Intel, look to invest in further developing next generation technology through the downturn so as to emerge on the other side ahead of competitors. To date more than 407 WiMAX networks have been deployed worldwide in a variety of scenarios, and WiMAX Forum expects this number to continue to grow steadily.

Source: Jonathan Singer, Market Research Manager, and XJ Wang, Senior Director of Marketing, WiMAX Forum.

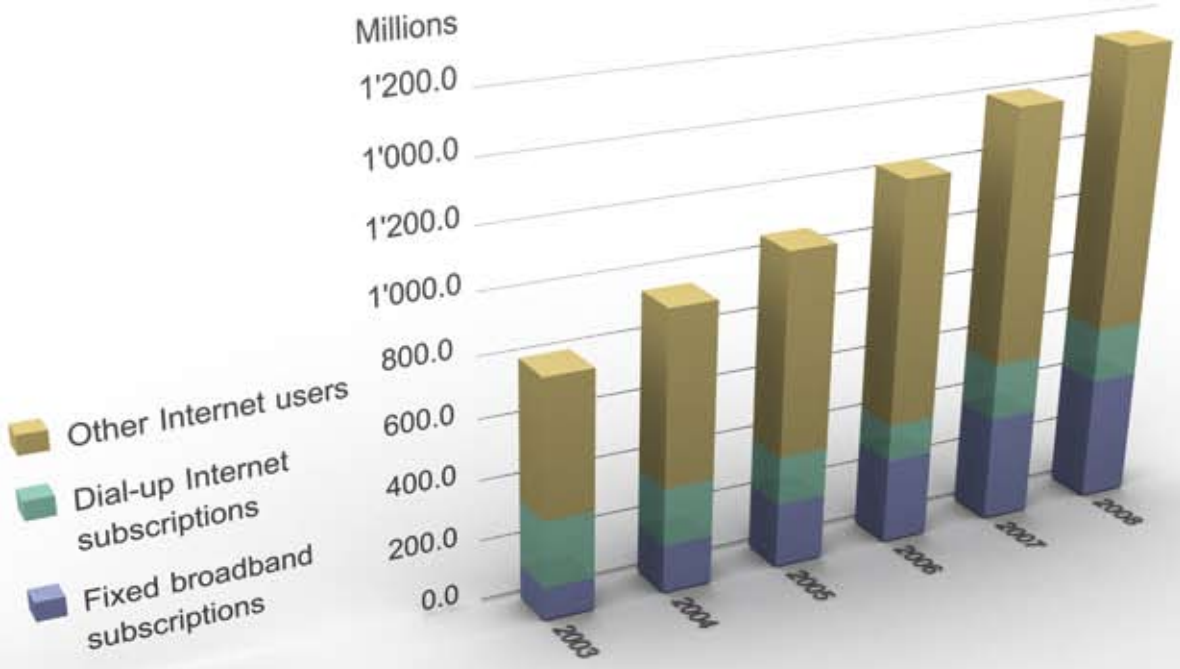
5.3 Broadband Internet and NGN

In many countries, access to Internet is now such a vital service that it is difficult to imagine life without it. The growth of the Internet has transformed modern lifestyles. Worldwide, the Internet has shown phenomenal growth over recent years (**Figure 8**).

Broadband connectivity is increasingly essential to participate in the online economy (**Figure 8**), as more and more websites use bandwidth-intensive technologies such as audio and video files, animated content and interactive applets.

Figure 8:

Growth in the Global Market for Internet, 2002-2008 (ITU)



Source: ITU World Telecommunication/ICT Indicators Database.

Insight 18: Prospects for Broadband in the Recession

Broadband is a vital driver of economic growth, not only in the demand it generates directly, but also in gains in economic efficiency and the creation of new markets for applications etc. The importance of broadband extends far beyond the telecom industry to influence many aspects of government and industrial policy. Governments around the world are seeking to improve digital inclusion and to maximize the economic benefits of Internet access as they strive to create modern information societies. Now, some are seeking to invest in the next generation of Internet access networks as a stimulus to broadband take-up and wider economic growth in the face of recession. The United States President Obama is already proposing a central role for broadband investment in his recovery plan for the country.

Point Topic has been tracking growth in broadband since 1999. In the UK, broadband was finally hit by the arrival of a recession in Q3 2008. The number of new broadband lines added in Q3 2008 was a clear 18% below expectations. Point Topic estimates that the UK added only about 200,000 broadband lines in the last quarter 2008, less than half Point Topic's pre-recession forecast.

Until recently, broadband in Britain grew largely by converting dial-up users to high-speed services. But now, few dial-up users remain and growth depends on the much slower process of connecting 'no-net' homes and businesses. As a market approaches saturation, the key issue driving further growth is the number of 'no-net' premises passed by one or more broadband services. Growth is already slowing in developed countries, as they approach saturation in broadband - new customers are harder to find. Developing countries such as China and India have also gone through their initial rapid growth phase and are now growing steadily, rather than exponentially.

Point Topic has applied its methodology based on historic take-up rates by 'no-net' premises to forecast global broadband lines. The recession is forecast to slow growth in broadband throughout H2 2008 and all of 2009. The results suggest that the total number of broadband lines in the forty largest broadband countries will grow from 393 million in December 2008 to 442 million broadband lines by December 2009, eleven million less than the 453 million additions expected without the recession. By 2013, the forty largest broadband markets will account for some 635 million lines. Taking into account smaller markets, the global market will add a total of 48 million broadband lines to reach 683 million in 2013,[115] equivalent to 10.8% annual compound growth over 2008-2013, well down from the 27.7% annualized average growth rate per year observed over 2004-2008, but still significant.

The impact of the recession on the rate of growth of the installed base is forecast to be felt most heavily in the USA, UK, Rep. of Korea, Australia and Hungary. However, projections for the USA, Japan, Germany, France and the UK remain within 0.3% on average of original forecasts. China, Brazil, Russia, Mexico and India all seem to be on rising growth curves despite the recession, while Viet Nam is expected to be relatively unaffected. So far at least, broadband is proving fairly robust in the face of recession, although it remains to be seen whether take-up will be curtailed, if the recession deepens. The broadband market is too new to have been seriously tested by recession.

Source Tim Johnson, Chief Analyst, Point Topic, with kind support from John Bosnell & Fiona Vanier, Point Topic.

Packet-based Next-Generation Networks are ultimately expected to replace traditional circuit-switched telecommunication networks. NGNs are managed broadband networks integrating service provision to end-users over the transport layers. Operators are making NGN upgrades both to core (transport or backbone) networks and to access networks serving end-users (such as the fixed copper/fibre local loop or wireless access).

The US Fiber-To-The-Home Council recently published a report noting that the expansion of NGNs could create 200,000 more jobs over each of the next three years in the United States and generate "extensive economic growth" with increased economic output of over US$ 100 billion. The Council is calling for tax incentives to promote the expansion of NGNs with direct fiber connections.[116]

As noted in ITU's *Trends in Telecommunication Reform 2008: Six Degrees of Sharing*, there are basically three approaches that operators can adopt to roll out advanced connectivity:

1) Deploying fibre as rapidly as possible;
2) Upgrading existing xDSL (copper) networks to provide Ethernet access; or
3) Deploying Fibre-To-The-Node in combination with VDSL in the local loop.

Although some projects for NGN roll-out have been postponed (**Section 4.1**), many operators are proceeding apace with the roll-out of NGN as the future of the industry. In mid-2008, the UK incumbent BT announced a major investment of GBP 5.1 billion (EUR 5.66 billion) in NGA with a Fibre-To-The-Cabinet (FTTC) network passing some 10 million homes (or 40% of UK households) by 2012. Telecom Italia is adopting a similar solution to achieve coverage of 65% of Italian households. Deutsche Telekom, France Telecom and KPN have all announced similar plans.

In Latin America in 2008, a Chilean operator has started deploying FTTH, while Brasil Telecom was expected to launch FTTH in six Brazilian cities.[117] In Asia, Sri Lanka Telecom has rolled out a 1500-km fibre-optic network connecting each of the country's twenty-five provinces by mid-2008, as part of an ongoing migration to an IP-based NGN.[118] In Africa, the Nigerian operator 21st Century Technologies is the first Sub-Saharan operator to roll out a GPON FTTH network. It plans to target

10,000 homes in the capital Lagos and to become a Triple Play operator. Deployment to the first 10,000 homes is starting in January 2009.[119]

And yet, the amounts required to invest in advanced FTTx networks are huge, and could cost six plus times more for rural areas as for urban, high population-density areas. According to an EU-commissioned analysis, up to EUR 300 billion (US $375 billion) might be needed to upgrade existing access networks in the EU to fibre.[120] Investment totaling some EUR 250 billion (US $ 313 billion) might be needed to roll out fibre networks in the original 15 EU Member States, with deployment from EUR 1,000 (US $1,252) per customer in urban areas, to EUR 6,000 (US $7,510) per customer in rural areas.[121]

In its December 2008 Report "Fiber in the Last Mile", Pyramid Research notes that some operators have already revised the scale of their FTTx deployments in response to the crisis – the leading FTTH carrier in Russia, VimpelCom, plans to focus on boosting uptake of its existing fiber networks instead of expanding their geographic coverage.

In the case of Fibre-To-The-Cabinet (FTTC), based on the experience of the UK, Analysys Mason estimates that nationwide deployment of FTTC would cost three to four times more than the telecom sector has currently spent to date on deploying the current generation of broadband services.[122] Analysys Mason also note that deployment costs are relatively constant across higher density areas, but significantly higher in more sparsely populated areas, highlighting the need for creative thinking about how to make rural areas more attractive to investment.

Broadband universal service obligations are one way forward; national broadband policies and state involvement in planning, financing and roll-out of broadband (at the national or municipal level) are other options. Faced with a credit crunch, the deployment of NGN could be delayed, unless more imaginative funding schemes and/or state involvement (at the local or national level) arise, for example, as part of a financial stimulus package. Rural models of coupling fibre backbones with broadband wireless access could be adopted more widely to ensure broadband deployment even during the financial crisis. Introducing infrastructure sharing to this model will drive costs even lower.

5.4 Satellite Technologies

As an industry dominated by high-value capital-intensive projects based on complex financing packages with long lead times, the satellite industry could prove vulnerable to the financial crisis and disproportionately affected by it. Satellite technologies underpin the provision of a host of communication services. They play a key role in providing spare back-up capacity to long-haul fibre, in addition to acting as a 'gap-filler' for low-density routes and service provision for remote and rural areas.[123] This could also make the satellite industry vulnerable during a downturn, when there may be less need for spare capacity.

However, the long lead times also shield the industry to some extent, as current activity is a reflection of projects planned a few years ago. The impact of the financial crisis is unlikely to be fully felt for two to three years, equivalent to the lead time to procure, build and launch a satellite (**Insight 19**). This partly explains why much industry commentary is so far optimistic, despite the financial crisis – today's activity reflects deals negotiated and agreed during the height of the boom period.

The year 2007 and the period up until mid-2008 were proving strong for the satellite industry, with solid transponder sales, rising fill rates and dynamic growth in regional markets. In 2007, consolidated revenues reached an eight-year high of almost US$ 9 billion according to Euroconsult.[124] The main engines of growth are Direct-To-Home (DTH) and demand for bandwidth for broadband data/video services. Here, satellite risks losing out to competition by triple-play offers. However, there is still growth in military communications and the market for satellite uplinks for coverage of live events (such as the US presidential inauguration), but the lack of a major sporting event in 2009 could hurt the industry.

The year 2008 was also pivotal for satellite broadband, which proved its commercial viability in the US consumer market. Telcos are looking to use satellite technologies to extend the reach and scope of their service provision (e.g. Orange has launched DTH services or by blending IP and satellite technologies). Emerging segments include consumer-class satellite broadband services, cellular backhaul, maritime and other mobile services. ABI Research forecast that the cellular backhaul market is expected to reach US$ 23 billion by 2012. Satellites for cellular backhaul are small in terms of the total cellular backhaul equipment solutions market, but this should change over the next 3-4 years.[125]

Insight 19: The Impact of the Financial Crisis on the Satellite Industry

The impact of the financial crisis on the satellite industry is unlikely to be felt fully for another two-three years, equivalent to the lead time to procure, build and launch a satellite. New operators and those seeking to undertake new projects are finding it more difficult to find funding. There is a lack of availability of credit and lending thresholds have risen. In addition, launch service providers[126] and insurance underwriters[127] have announced that they intend to increase their prices in 2009. These factors mean that only the most commercially promising projects are likely to go ahead over the next few years.

Impact for Start-Ups

Lenders have tightened their lending requirements for new space ventures and their appetite for new projects has been curtailed. Those wishing to exploit new commercial opportunities face a higher entry threshold, if they need to finance their projects. Lenders require higher comfort levels, before they will part with funds and are likely to need, amongst other things:

- A sound business plan with a demonstrable market;
- Signed contracts from customers wishing to purchase their services;
- Backing from blue-chip partners; and
- Pre-existing and long-standing relationships with the banks.

Launching a spacecraft is not only costly, but extremely risky. Obtaining financing for projects has always been the hardest barrier to overcome. Investment banks are very reluctant to lend, unless they are certain that they can recover their capital outlay and profits in the event of a catastrophic failure. More recently, the bar has been raised by investment banks.[128] Obtaining funding for new projects is likely to become even more challenging.

Launch Services

There are relatively few proven commercial launch service providers capable of taking a satellite to geostationary orbit. Arianespace, Sea Launch (which returned to service in 2008, after more than a year

off) and International Launch Services (ILS) are the main providers of services, typically performing approximately 50%/25%/25% (half/quarter/quarter) of commercial launches in any given year. Other launch service providers include China Great Wall Industries Corporation (CGWIC) and the Indian Space Research Organisation (ISRO). Both Sea Launch and ILS have experienced launch failures over the last two years, causing bottlenecks for potential launch opportunities, raising launch service costs. The cost to launch a large satellite to geostationary orbit is now in excess of US$ 100m, although greater activity by India and China looks set to have a beneficial effect in reducing costs for launch capacity.

The Insurance Markets

Space insurance is offered for launch risks and in orbit risks (usually for an initial twelve-month period), after which launch policies are renewed to become in-orbit policies. As a rule of thumb, the insurance markets estimate failure rates as being approximately 1 in 7 for launch business, equivalent to premium rates between 10-20% for initial launch insurance (depending on the position in the market cycle). Insurance is frequently the third-largest cost for any new satellite-based project, but the volatility of the insurance market makes budgeting extremely difficult.

The main driver of trends in insurance is of course losses. The insurance markets anticipate insuring 20-30 commercial launches each year. If insurance capacity remains high, the markets will remain competitive. We anticipate that insurers will seek to raise rates at the start of the year. If there are no significant losses in the early part of 2009 and the market is competitive, i.e. the supply of capacity is high – which is likely to be the case given that underwriting capacity is committed for the full year – we would anticipate that prices would fall. It is the frequency and size of losses that drive the insurance markets and the impact of the credit crisis is more likely to be a factor used to justify pricing.

Major players predict that rates are likely to increase during 2009.[129] *Munich Re* believes that they will see higher demand, as the capital market crisis depletes customers' capital. If reinsurance rates rise, insurance rates are likely to follow, but if competitive

market forces prevent the insurers from passing on these increases, insurers margins will be squeezed, leading to the prospect that insurers may be forced to withdraw from the market.

Following the launch failures over the last 24 months, launch rates have been on an upward trend recently. However, despite the losses, few insurers have exited the market, ensuring that a ready supply of capacity is available. The 2008 underwriting year is presently showing a profit across both launch and in orbit business of about US$ 340 million[130], which may put the brakes on any attempts to increase rates.

Conclusions

The credit crisis may result in the launch of fewer new projects, as a result of increasing project costs and limitations on credit available, but the impact is unlikely to be substantial and will probably be compensated for by other factors. Launch service providers and insurance companies have suggested that they may have to increase the pricing of their products and the banks have raised the threshold for access to space by introducing more stringent requirements for lending to go ahead.

The market for satellite services is buoyant and many analysts have commented that it will continue to expand over the next few years.[131] In essence, the market is not dependent on new entrants. It may also be the case that the credit crisis has struck at a point in time when emerging technologies (such as space tourism, Earth-imaging and pharmaceutical testing) are not yet ready to enter the market. If the credit crisis persists for 12-18 months, new technologies may emerge at the right time to take advantage of their competitive pricing.

Source: Neil Stevens, Vice President, Marsh Limited, UK.

Growth in demand for broadband and Fixed-Satellite Service (FSS) is confirmed by the latest ITU data. According to data maintained by ITU's Radiocommunication Bureau, the number of satellite network notifications by administrations has been increasing steadily over the last two years. Notification submissions give an indication of the satellite networks brought into use, and they show strong FSS applications in all three main bands - C, Ku and Ka - with growing operation in the Ka bands, which are generally used for broadband applications (**Appendix 1**). Analysis of the satellite network coordination request submissions over the last two years confirms growth in the future of FSS applications in all three main bands, with most of these networks being brought into use over 2012-2015 (**Appendix 2**).

Box 2: Growth Projections from Northern Sky Research (NSR)

Between 2007 and 2017, NSR forecasts that global demand for commercial C- and Ku-band transponders will increase by more than 1,500 36 MHz transponder equivalents, and revenues will grow at the average annual rate of 4.5%. 83% of the newly-leased transponders will be for video distribution and Direct-To-Home (DTH), as well as occasional-use television services. NSR estimates that the satellite industry generated US$ 8.33 billion in revenues in 2007 from commercial C- and Ku-band capacity leasing, and this should grow to US$ 12.90 billion in 2017.

Source: Northern Sky Research's Global Assessment of Satellite Demand, December 2008, available at: http://www.northernskyresearch.com/Reports/SatelliteReports/GASD5.html.

Nevertheless, early evaluations of the effects of the crisis on the satellite industry suggest that there has been some immediate impact, in the drying-up of funds from investment banking institutions and greater difficulty obtaining funds for entrepreneurial "NewSpace" ventures. The debt markets that provided critical finance for the private equity acquisitions into and exits from the FSS sector are now closed, and the FSS sector is mostly already consolidated.[132] Goldman Sachs notes that "private equity has shown a strong interest in the satellite sector".[133] Meanwhile, HSBC notes a resurgence in project and export finance: "the structured nature of deals means that both project and export finance markets are still open, despite the current bank market climate".[134]The current crisis makes huge transactions on the scale of Harbinger's attempted acquisition of Inmarsat exceedingly unlikely.

As seen from the ITU Radiocommunication Bureau data, the impact of the financial crisis might temporarily reduce submissions of satellite network notifications by administrations over 2009-2011, should administrations/satellite operators experience difficulties in financing satellite manufacturing and launches in time for the regulatory deadlines for bringing them into use. This could result in a postponement of projects. At the same time, a continuing steady rate of coordination request submissions at the ITU from 2009-2011 supports ongoing growth in demand for satellite services.

In addition to notifications of new satellite networks, another indicator of the dynamism of the satellite industry is the updating of the list of operating administration/agencies in operational control of the space stations (mandatory information to be provided with the satellite network filing submissions). More than twenty new operating agencies have been submitted to the ITU Radiocommunication Bureau over the last two years, underlining the strong growth in the industry.

Direct-To-Home (DTH) and High-Definition (HD)

DTH is by far the single most important market for the satellite industry, because it drives competition with cable and IPTV services, and generates demand for transponder capacity (for HD channels, headend-in-the-sky or HITS, and SD channel bouquets, as well as news and sports). NSR notes that the current economic crisis may initiate consolidation in the DTH market, but believes that a stronger DTH

market will emerge, as weaker players are integrated and their capacity helps market leaders expand their offerings.[135] Euroconsult notes that the current crisis may slow content purchase by pay-TV broadcasters: "while the economic crisis may have an impact on growth in the TV and media sectors, it will also highlight their resilience and the revenue security operators enjoy by way of long-term contracts".[136]

According to NSR, the number of HD channels carried on C-band capacity for the North American cable head-end market is expected to double for 2008. In Western Europe, HD programming on Ku-band capacity for free-to-air, cable and DTH distribution numbered 65 channels at the end of 2007 and is projected to exceed 100 at the close of 2008. HD programming is growing in developing markets in Central and Eastern Europe, South America and Asia, a "key positive sign for the industry".[137]

Quote 3: Outlook for the Satellite Industry by NSR

"It is likely that commercial satellite operators will feel some discomfort over the next 12-18 months, but it will be more in the order of a few quarters of somewhat slower demand growth compared to the last few years, rather than outright transponder demand contraction. More importantly, the launch of numerous new satellites over the 2009-2010 time period, both strengthening existing orbital locations and opening new slots, should come just in time to address reemerging demand in many sectors as economic conditions improve. This could well lead to a sharp boost in demand over the 2010-2011 period".

Source: Patrick French, NSR Senior Analyst & author of NSR's "Global Assessment of Satellite Demand".

Fixed Satellite Services (FSS)

TV broadcasting and video services have driven growth in the FSS over the least ten years. Sustained demand for capacity for military communications has also boosted demand for satellite capacity. In September 2008, Euroconsult announced 9.5% growth in satellite market revenues, which amounted to some US$ 8.9 billion in 2007, leaving "satellite operators in a good position to resist the economic downturn".[138] Growth in the fixed satellite market has continued, driven by greater demand for digital TV broadcasting, corporate networks, government communications and cellular backhaul. The fixed satellite sector grew in terms of both transponder demand (+8%) and revenues (+9.5%), with emerging markets playing an important role.[139]

Increasing capacity requirements and several recent launch failures have resulted in capacity shortages in certain areas. In most other regions, a trend towards higher fill rates has helped improve operators' profit margins and stabilize capacity prices. Euroconsult notes that "fill rates remain extremely high, providing a degree of protection from the economic downturn".[140]

New satellite systems are also emerging, jointly backed by public and/or private funds (**Box 3**). New satellite operators have entered the market in the Middle East, Asia, Europe and Latin America, with their first satellites planned to be in orbit over the next three years.

Box 3: Satellite Industry Prospects to 2017 from Euroconsult

Growth of the FSS industry should continue over the coming years, despite the global economic downturn. Basic communication requirements and the development of digital TV will remain strong drivers for the industry. While a slowdown is expected, growth rates of infrastructure revenues will likely still average about 5% per year between 2008-2012. After 2012, a progressive slowdown may be observed in several regions due to the end of analog transmissions, increasing terrestrial competition and a potential new consolidation phase in the burgeoning digital TV markets.

Euroconsult expects the market value of capacity used for the traditional FSS market to reach almost US$ 12 billion in 2017, with Europe remaining the largest market at US$ 2.9 billion in annual revenues.

The addition of wholesale revenues from emerging systems dedicated to satellite consumer broadband access would increase the global market value to US$ 14.4 billion by 2017. Industry consolidation will continue, but will be offset by the emergence of new regional satellite systems backed by either private or public investors. According to Euroconsult, growth is expected in all world regions in the next ten years, except possibly in North-East Asia, due to lower demand for telecom services.

Source: "World Satellite Communications & Broadcasting Markets Survey, Market Forecasts to 2017", Euroconsult.

Quote 4: Outlook for Fixed Satellite Services (FSS)

"While the next few years will prove challenging for many industries, FSS satellite operators are still likely to enjoy growth, albeit more moderate. Thanks to diversified sources of revenue both by application and region, and solid fundamentals, many actors in the FSS industry are likely to nonetheless weather the storm".

Source: Pacome Revillon, Managing Director, Euroconsult, from the article "FSS Operators: Structural Strengths in an Uncertain Economy", Satellite Finance, November issue.

Mobile Satellite Services (MSS)

Mobile satellite services (MSS) have witnessed sustained growth over the last years, due to military usage and growing communication needs in a number of markets. In July 2007, Euroconsult estimated that the MSS industry has been growing at a CAGR of over 17% since 2001 and generated total revenues of over US$ 1.2 billion in 2006.[141] In 2008, the hedge fund Harbinger Capital Partners tried unilaterally to consolidate the MSS sector by entering into a complex arrangement to finance and potentially acquire Inmarsat through Harbinger Capital portfolio company SkyTerra, parent of Mobile Satellite Ventures.

Several operators are now entering a new investment cycle, with planned capex of over US$ 5 billion for new MSS systems.[142] Even more funding could be required for a ground infrastructure over the coming years in order to realize MSS/ATC (a hybrid satellite/terrestrial communications network across the US). Growth in MSS is being driven by new markets and applications such as asset tracking, mobile satellite broadband, ancillary terrestrial component (ATC) and a growing aeronautical market.

Some MSS players may seek consolidation due to lack of independent financing - the MSS sector is divided into businesses based on the roll-out of ATC service and those that are not, Since ATC is still largely an unproven market and no strategic terrestrial telecommunication operators are yet involved, consolidation may arise in the tighter financing environment.[143]

Box 4: Space and the Financial Crisis

An economic slowdown, especially when coupled with a contraction in credit, will have even healthy satellite operators rethinking their plans for purchasing new satellites. This is especially true for low Earth orbit satellite companies like Globalstar, Iridium, and ORBCOMM, all of whom would need to develop next-generation satellite constellations to replace their existing, aging spacecraft and stay in business.

At the other end of the spectrum from the big aerospace companies and satellite operators are the fledgling entrepreneurial space companies developing suborbital and orbital launch vehicles, among other products and services. While a few of these companies, like Virgin Galactic, SpaceX, and Blue Origin, have deep-pocketed founders who can fund most or all of their development internally, many others need to seek outside investors, be they individual "angels" or larger institutional ones. That search, already difficult in good economic times, may become harder in today's uncertain economy.

If there are cutbacks or reduced growth at NASA or in military space efforts (where penchants for cost overruns and schedule delays could make tempting targets for cost-cutting budgeteers), the impact will go beyond the government agencies themselves. Aerospace companies who work on civil and military space programs will feel the impact of any cuts, leading to reduced income, lay-offs, and more.

Source: "Space and the financial crisis", Jeff Foust, 20 October 2008, available at: http://www.thespacereview.com/article/1236/1.

Quote 5: Looking for Funding for a Space project? View from a Venture Capitalist

"When the market is uncertain and tumultuous, the latest-stage investors dry up the soonest. That means your ability to get a US$ 50 million check for expansion capital quickly dries up, because those are the people who watch the Initial Public Offering (IPO) market closely. In contrast, early-stage VC investors look beyond near-term economic conditions. We're looking out five to seven years from first investment - Today's market doesn't matter".

Source: Steve Jurvetson, managing director of venture capital firm Draper Fisher Jurvetson (DFJ), quoted in "Space and the financial crisis", Jeff Foust, 20 October 2008, available at: http://www.thespacereview.com/article/1236/1.

Conclusio

ns: Investing In The Future

This Report has examined the impact of the financial crisis on the global ICT industry, including telecommunications. It briefly examined how the niche origins of the crisis in the US mortgage market have now triggered a global economic slowdown, the impact of which is now being felt around the globe. It is now difficult to speak of one crisis - financial or economic. Instead, this Report has examined how the current market difficulties encompass a set of challenges, in the credit crunch and drying-up of credit; the financial crisis and failure of several high-profile banks; and the subsequent economic slowdown.

The Report examined the challenges posed by the financial crisis to investment in and regulation of telecommunication networks and the ICT industry, against the ongoing background transformation of the industry towards advanced next-generation networks. The roll-out of NGN is revolutionizing the roles of network operators, ISPs and media/content delivery providers, while promising to transform the way in which innovative new services are delivered, as well as regulated. The financial crisis could delay the roll-out of NGN, but conversely, it could also speed up the transformation of the industry by creating new openings for nascent technologies.

The financial crisis has mixed consequences for the global ICT industry. The credit needed for vital investment in information infrastructure is now more expensive and less abundant. There is evidence that some operators are cancelling or postponing their investment plans. Alternative sources of finance are needed. There is growing pressure on governments to help finance some of the NGNs currently being built or planned. The impact on consumer demand is uncertain, in reduced demand or demand for alternative services. Network operators and service providers are adapting their strategy by taking a rigorous approach to cost control and focusing investment on vital services only.

The ICT industry is a vital sector underpinning many other sectors and driving economic growth. ICTs are key pervasive technologies helping ITU Member States weather the economic storm, not only as a key sector in their own right, but also by boosting economic growth and increasing economic productivity and efficiency. Many communication technologies (including mobile

telephony and broadband) still offer huge growth potential, with or without a recession.

In many ways, the telecommunication industry is in better shape today than after the *dot.com* crisis of 2001/2002. In many countries, the Internet is now a mainstream feature of present lifestyles; global communication networks underpin international trade and finance; modern working methods are based on constant connectivity 'anywhere, anyhow, any time'. Operators and Internet service providers that had already shed excess capacity after the tech bubble now enjoy regular income from established clients; their services are in demand; new and innovative applications are being introduced and have gained market acceptance.

Previous downturns show that economic crises create openings for disruptive technologies.

The current financial crisis is likely to follow a similar pattern. In some ways, it will reassert the old order with those ICT companies with sustainable business models, stable cash-flows and deep pockets regaining some of the ground they have lost to new market entrants. Investing in knowledge is even more vital in times of crisis, not less so, and could enable the global economy to innovate its way out of this crisis. Ultimately, for an industry based on innovation and technological change, the financial crisis may challenge some businesses, but it will also revitalize the industry and enable new entrants with new technologies to thrive.

Appendix 1: Notification of Number of Satellite Filings per Administration, 2007-2008

			Number of Filings			Bands					
tf_rsn	adm	ntwtk_org	2007	2008	Total	2007			2008		
N	ARG			1	1					Ku	
N	ARS	ARB	1	1	2		Ku		C		
N	AUS		4	4	8		Ku	Ka		Ku	Ka
N	B		2		2	C	Ku				
N	BLR	IK		4	4				C	Ku	
N	CAN		1	3	4	C	Ku		C	Ku	Ka
N	CHN		12	32	44	C	Ku	KA	C	Ku	Ka
N	CYP			2	2				C	Ku	
N	D		1		1	C	Ku				
N	F		4	8	12	C	Ku	Ka	C		Ka
N	F	ESA		1	1					Ku	
N	F	EUT	13	11	24		Ku	Ka		Ku	Ka
N	G		4	1	5	C		Ka	C		
N	HOL		1	3	4	C	KU		C	Ku	Ka
N	IND		2	11	13	C			C	Ku	
N	INS		6	5	11	C	Ku		C	Ku	
N	ISR		2		2		Ku				
N	J		9	5	14	C	Ku	Ka		Ku	Ka
N	KOR		3	3	6		Ku				Ka
N	LBY		1		1	C	Ku				
N	LUX		6		6	C	Ku				
N	MEX			2	2				C	Ku	
N	MLA		1		1	C	Ku				
N	PAK		1		1	C	Ku				
N	RUS		3	18	21		Ku		C	Ku	Ka
N	S		1	1	2		Ku	Ka		Ku	
N	SEY		1		1	C				Ku	
N	SNG			1	1				C	Ku	
N	THA		3		3		Ku	Ka			
N	TON		1		1	C					
N	TUR		1		1	C					
N	UAE		1	2	3	C	Ku		C		
N	USA		34	40	74	C	Ku		C	Ku	Ka
N	VTN		2	1	3	C	Ku		C	Ku	
		Total	121	160	281						

Source: ITU Radiocommunication Bureau srs_all database. Notes: Received between 01.01.2007 and 19.12.2008.
Number of filings = count of unique identification number given to each satellite network and date of receipt.

Appendix 2: Coordination Requests of Number of Satellite Filings per Administration, 2007-2008

			Number of Filings			Bands					
tf_rsn	adm	ntwtk_org	2007	2008	Total	2007			2008		
C	ARS	ARB	2		2	C	Ku				
C	AUS		3		3	C		Ka			
C	B		1	2	3	C	Ku	Ka	C	Ku	
C	BLR	IK		2	2				C	Ku	Ka
C	CAN		1	10	11			Ka	C	Ku	Ka
C	CHN		12		12	C	Ku	Ka			
C	CYP			5	5				C		
C	CZE		1		1		Ku	Ka			
C	D			4	4				C		Ka
C	E		1	1	2	C	Ku	Ka			Ka
C	EGY			5	5					Ku	Ka
C	F		10	6	16	C	Ku	Ka	C		Ka
C	G		19	16	35	C	Ku	Ka	C	Ku	Ka
C	GRC			1	1				C	Ku	Ka
C	HOL		14	2	16	C	Ku	Ka	C	Ku	Ka
C	IND		11	11	22	C	Ku	Ka	C	Ku	Ka
C	INS		3	3	6	C	Ku		C	Ku	
C	ISR		1	2	3		Ku	Ka		Ku	Ka
C	J		7	7	14	C	Ku	Ka	C	Ku	Ka
C	KAZ		5		5		Ku	Ka			
C	KOR		4		4		Ku	Ka			
C	LUX		14	29	43	C	Ku	Ka	C	Ku	Ka
C	MEX		1	3	4	C				Ku	
C	MLA		1		1	C	Ku	Ka			
C	NZL		1		1		Ku				
C	PAK		1		1	C	Ku				
C	PNG			2	2					Ku	
C	RUS			4	4					Ku	Ka
C	S		1	1	2	C	Ku	Ka	C	Ku	Ka
C	THA			1	1				C	Ku	Ka
C	TUR		13		13	C	Ku	Ka			
C	UAE		6	10	16	C	Ku	Ka	C	Ku	Ka
C	UKR		1		1			Ka			
C	URG		1		1	C	Ku	Ka			
C	USA		7	5	12	C	Ku	Ka			Ka
C	VTN		1		1	C					
		Total	143	132	275						

Source: ITU Radiocommunication Bureau srs_all database. Notes: Received between 01.01.2007 and 19.12.2008
Number of filings = count of unique identification number given to each satellite network and date of receipt.

Abbreviations

List of Abbreviations and Acronyms

ARPU	Average Revenue Per User
ATC	Ancillary Terrestrial Component
BRIC	Brazil, Russian Federation, India and China
CAGR	Compound Annual Growth Rate
Capex	Capital Expenditure
CDMA	Code Division Multiple Access
CEO	Chief Executive Officer
CHF	Swiss Franc (currency)
CIO	Chief IT Officer
DSL	Digital Subscriber Line
DTH	Direct-To-Home
EBITDA	Earnings Before Interest, Taxes, Depreciation & Amortization
EU	European Union
EUR	Euro (currency)
FDI	Foreign Direct Investment
FMC	Fixed-Mobile Convergence
FMS	Fixed Mobile Substitution
FSS	Fixed Satellite Services
FTTC	Fibre-To-The-Curb or Fibre-To-The-Cabinet
FTTH	Fibre-To-The-Home
FTTN	Fibre-To-The-Node
FTTx	Fibre-To-The-x
GBP	British Pound Sterling (currency)
GDP	Gross Domestic Product
GPON	Gigabit Passive Optical Network

Abbr

GSMA	GSM Association
HITS	Headend-In-The-Sky
HSBC	Hongkong [sic] Shanghai Banking Corporation
HSPA	High-Speed Packet Access
ICT	Information & Communication Technology
ICTs	Information & Communication Technologies
IMF	International Monetary Fund
IP	Internet Protocol
IPO	Initial Public Offering
IPTV	Internet Protocol Television
IT	Information Technology
ITU	International Telecommunication Union
LIBOR	London Interbank Offered Rate
LTE	Long-Term Evolution
M&A	Mergers & Acquisitions
NGA	Next-Generation Access
NGN	Next-Generation Network
OECD	Organisation for Economic Cooperation and Development
Opex	Operating expenditures
PSTN	Public Switched Telephone Network
QoS	Quality of Service
R&D	Research & Development
RCIP	Regional Communications Infrastructure Program
ROI	Return On Investment
THB	Thai Baht (currency)
TMT	Technology, Media and Telecommunications

TNC	Trans-National Corporation
TV	Television
UHF	Ultra High Frequency
UN	United Nations
UK	United Kingdom
ULL	Unbundled Local Loop
US	United States of America
USD	United States Dollar (currency)
USO	Universal Service Obligation
VAS	Value-Added Services
VDSL	Very-high-data-rate digital subscriber line
VoIP	Voice over Internet Protocol
W-CDMA	Wideband Code Division Multiple Access Evaluation
WiMAX	Worldwide Interoperability for Microwave Access
WSIS	World Summit on the Information Society
xDSL	xDigital Subscriber Line
3G	Third-generation

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