Confronting the CRISIS

ICT Stimulus Plans for Economic Growth

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Confronting the Crisis: ICT Stimulus Plans for Economic Growth

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Insights

Message fro

We are now one year into the financial crisis which erupted in the autumn of 2008 and which has taken its toll on the global economy and financial markets. The financial crisis and associated economic slowdown are virtually unprecedented in size and scale, as well as the speed with which they have spread. Although stock markets have recovered somewhat and some economists are now more optimistic, it is clear that the world will continue to experience the economic aftershocks for some time yet, whilst undertaking the structural adjustments needed to respond fully to life after the crisis.

In common with many service and utility industries, the Information and Communication Technology (ICT) industry has been impacted by the financial crisis in reduced demand, operational cutbacks and curtailed investment. Nevertheless, the ICT industry is a fast-moving, adaptive and resilient industry that stands to benefit from the large investments announced by governments as part of their stimulus plans over recent months. I remain convinced that, as an essential strategic industry, ICTs offer vital means of boosting economic productivity and generating economic recovery.

This crisis has revived long-running debates in economics – not only has it called the doctrine of the free market back into question, it has also reawakened debate over the role of government in infrastructure investment, the meaning of Keynesian demand management in a globalized era, and whether state investment 'crowds out' private sector investment. These debates are very relevant to the ICT industry, which lies at the crossroads of public-private sector investment as it upgrades and engages with the long-term transition to Internet Protocol (IP)-based networks.

ITU remains deeply concerned by the impact of the financial crisis on its Member States and Sector Members. That is why last autumn, I commissioned this series of reports to monitor and evaluate the impact of the crisis on the ICT industry. This Report examines how policy-makers can respond to the crisis and the role of economic stimulus plans and ICTs in reigniting economic growth. What role can investments in ICTs play in economic recovery? Should investments in broadband networks form an essential part of any stimulus plan? Are there any lessons to be learned for effective stimulus or any obvious design flaws in the way these plans have been structured?

m the ITU Secretary-General

Where do developing countries stand in relation to stimulus plans and what are the implications for the digital divide? Much of this Report draws on capitalist economic theory and the initial experience of OECD countries in responding to recession, but what are the key policy conclusions for developing countries? We are at an early stage, where answers to many of these questions remain tentative. Nevertheless, it is important to address these issues upfront, to ensure that stimulus funds are well-spent to the benefit of developing countries and the ICT industry at a time of limited resources. The policy choices made now will determine how much countries and nations benefit from next-generation technologies.

ITU remains committed to connecting the world. The financial crisis is challenging many firms, with much at stake – yet, given the strategic importance of the ICT industry in underpinning the communication capabilities and informational and data processing needs of other industries, we cannot afford to fail in our ambitions to provide connectivity to all the world's inhabitants. The ICT industry is an industry based on technological advances and innovation as a long-term investment for the future. If the industry can navigate these uncertain times successfully over the next few years, I firmly believe that its long-term future success will be assured and that the ICT sector has a major role to play in fuelling the economic recovery.

Dr Hamadoun I. Touré
ITU Secretary-General

1.

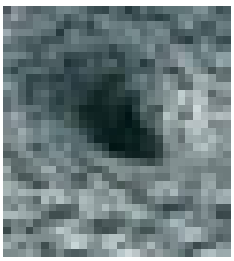
Executive Summary

The financial crisis that erupted a year ago has shaken the global financial sector to its foundations and sent the economies of many industrialized countries spinning into recession, while slowing the growth of major emerging markets. The size and scale of the global economic slowdown have proved staggering (**Insight 1**). Stock markets have recently recovered ground off recent lows and economists are finding cause for optimism, but economic analysts at leading institutions such as the IMF, World Bank and OECD are virtually united in their agreement that the recovery will be weak, slow and uneven. Global unemployment is rising fast and promises to persist, well after economic recovery finally starts.

The financial crisis and credit crunch have cut directly across many operators' investment plans to upgrade existing networks (**Table 3**) and roll out various Next-Generation Networks (NGNs). Not only do operators face more expensive and more limited financing, they also face great uncertainty over the regulatory future and revenue streams associated with NGNs. The massive investments required, changing business models and only uncertain future revenues and returns have led to calls for governments to get more involved in the financing and roll-out of NGNs. As public and private service delivery increasingly shifts online, access to broadband is increasingly becoming a public policy problem, if balanced development is to be achieved (**Insight 5**).

This Report examines the scope for public financing and the role that the ICT sector and economic stimulus plans can play in regenerating economic growth and promoting economic recovery. More than fifty countries have launched economic stimulus plans in an effort to boost aggregate demand (**Insight 4**) – the OECD records as many as 25 OECD countries as having announced stimulus plans, while major emerging and transition countries including Brazil, Chile, China and the Russian Federation have also launched similar initiatives to stimulate their economies.

Investments in ICT can play a strong role in generating long-term economic growth, as they offer strong multiplier effects in returns

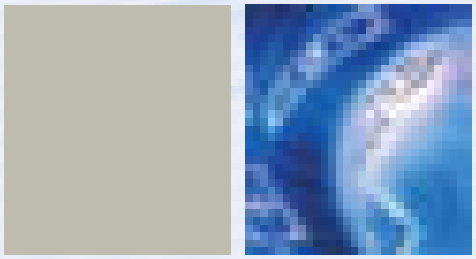


on investment, strong externalities and reduced economic leakages (**Section 3.1**). These strong externalities to ICT infrastructure suggest that the social returns on investment in ICTs are likely to exceed the private returns significantly, implying that private sector activity alone is unlikely to generate socially optimal levels of investment.

Although economists still debate appropriate measures to combat the recession (**Insight 2**), investments in ICT and broadband networks have a major role to play in any stimulus plan, as they can be 'shovel-ready' investments that promise stronger marginal returns on supply and greater productivity gains than other forms of infrastructure (such as transport infrastructure, for example). They represent a long-term investment in national infrastructure and skills base. Further, experience to date suggests that although long-term large-scale public infrastructure investments take longer to plan and execute, infrastructure investments are likely to generate more robust and durable economic growth than other types of stimulus measures (such as tax rebates). To be most effective, leading economists have suggested that stimulus measures should be timely, targeted and temporary.

On this basis, many OECD countries have included ICT and broadband investments in their stimulus plans, with new state financing plans for national broadband infrastructure. After over two decades of growing private sector participation in telecommunication infrastructure, government is back and there are signs of growing state involvement in the financing of network and infrastructure roll-out in a number of countries.

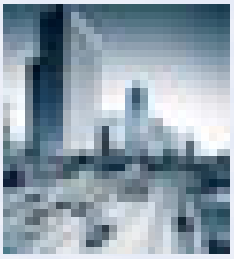
To date, broadband stimulus plans have focused mainly on financing – both in the huge investments announced (but not yet fully disbursed in many cases), as well as in the credit lines and open investment models that some governments are exploring to fund ICT network deployment. This emphasis on financing raises several concerns - first and foremost, there is the risk that governments may crowd out private sector investment (**Insight 8**). However, this may be less of a danger during a recession and credit crunch, when private sector investment is likely to be severely constrained in any event. Several commentators have emphasized that stimulus funding should be temporary and targeted, to minimize crowding out.

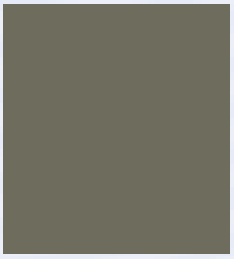


Furthermore, broadband stimulus plans create risks that governments engage in 'picking technologies', 'picking winners' and 'picking communities'. There are also likely to be consequences for competition in whether state financing could tilt the playing field and implicitly favor incumbents with extensive established backbone networks. Stimulus plans must be designed carefully in such a way as to minimize these dangers. It is important to address these issues upfront to ensure that stimulus funds are well-spent to the benefit of the industry, consumers and society.

In reality, this emphasis on funding models in response to the financial crisis and compensating for financing difficulties for operators may overlook other more simple and immediate measures that governments (and regulators) can take to promote private sector investment by reforming taxation, promoting competition, creating greater regulatory clarity and certainty and/or resolving spectrum issues (for example, governments can accelerate the transition to digital TV to free up spectrum more quickly, simplify licensing procedures, optimize spectrum allocation through refarming or spectrum trading and promote colocation and infrastructure sharing, etc). There are a number of measures that governments can take to promote an enabling framework for greater investment despite a lack of readily available credit, before (or in addition to) resorting to funding. Developing countries with limited resources available for stimulus plans can consider undertaking other measures to promote greater private investment.

To date, stimulus plans in developing countries have tended to focus on other, more urgent needs in housing, sanitation and transport infrastructure and may have failed to prioritize ICT infrastructure to a large degree, missing out on the stronger marginal impacts of ICT investments on supply and productivity. In this respect, developing countries may be neglecting a great development opportunity of the economic benefits broadband infrastructure can bring (**Insight 9**). If industrialized countries forge ahead with state-subsidized investments in high-bandwidth networks, developing countries may again find themselves on the wrong side of a growing digital divide.





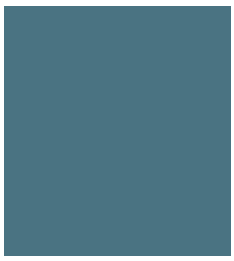
Outlook for Different Technologies

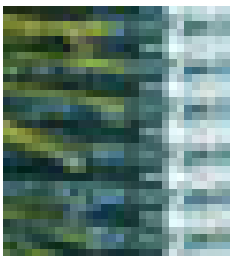
The global ICT industry as a whole has seen common trends in reduced demand, operational cutbacks and curtailed investment, but overall, the ICT industry has proved relatively resilient, compared with some other sectors, and some analysts see signs of recovery in the ICT sector (**Insight 10**). However, the crisis is having a markedly different impact on different ICTs, with growth in some sectors (such as mobile and satellite) remaining buoyant. This makes it difficult to speak of the general overall experience of the sector, without reviewing the growth prospects for individual technologies.

The mobile industry has weathered the economic slowdown relatively unscathed, with only a mild slowdown in growth. Global growth in mobile subscribers was subdued throughout early 2009, with a weak first quarter in terms of mobile handset shipments. Growth in major emerging markets has slowed somewhat, but virtually all emerging markets continue to grow, albeit at a reduced rate. Only a handful of countries have seen reductions in their mobile subscriber base, with some mobile operators taking advantage of the current climate to tidy up their subscriber bases and eliminate inactive accounts.

Certain niche markets (such as the smartphone) have also proven immune to the recession. Projections of mobile service revenues remain positive over the short- to medium-term. The wireless industry has been well-served to date by private sector provision, partly due to the lower initial outlays, rapid payback times and healthy returns on investment. This may explain why some economic stimulus plans have tended to overlook the wireless sector and focus on wireline infrastructure. The mobile industry looks set to continue delivering steady, albeit slower, growth and profits despite the financial crisis (**Insight 11**). Operators are focusing on adapting their business models and developing their mobile broadband operations to secure long-term growth.

For broadband Internet and Next-Generation Network (NGN) deployments, 2008 proved a tough operating year, but growth over 2008 and Q1 2009 was in line with long-term trends (**Insight 12**). Deployments of broadband networks and NGN are set to continue, with or without





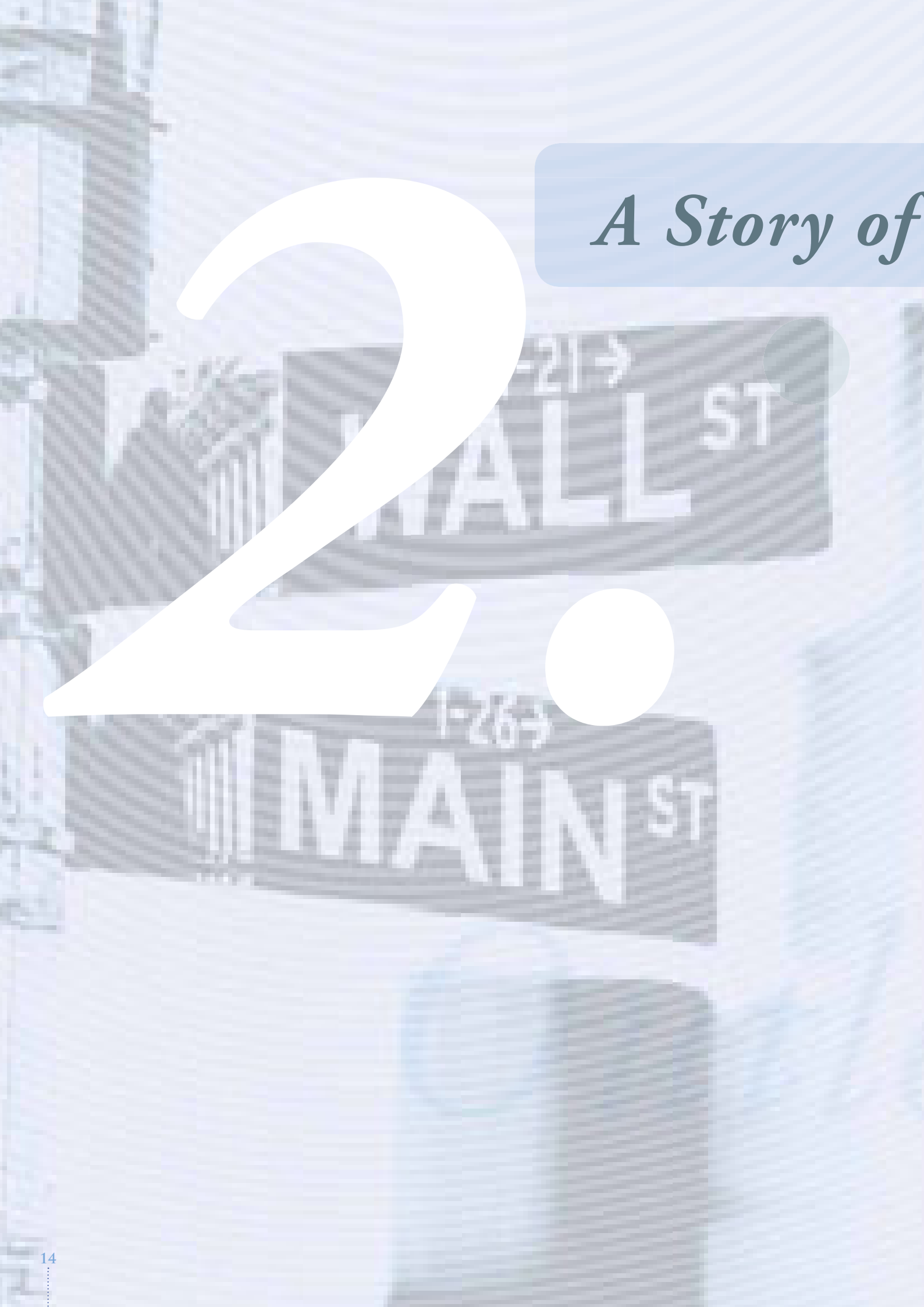
state intervention. Consumer demand for higher bandwidth applications and new services is fuelling growth - broadband subscriber additions in Q1 2009 remained strong in the US, China, Brazil and Canada, whilst broadband subscriber additions in Latin America and Southern and Eastern Asia also looked healthy (**Insight 12**).

Growth in Voice over Internet Protocol (VoIP) subscribers continues unabated, with some suggestion that the recession could inspire cost-conscious consumers to explore bundled services that are perceived to be cheaper in some markets. ITU's annual regulatory survey suggests that regulatory frameworks for VoIP and NGN are catching up with the market reality – by mid-2009, just over two-thirds of all countries had explicitly legalized commercial offerings of VoIP or implicitly condoned VoIP. Global Fibre-To-The Home (FTTH) installations are forecast to grow at a steady rate of 30% over the next five years, even before the effects of stimulus investment in FTTx in some countries are felt.

The satellite industry also continues to sustain healthy growth rates throughout the financial crisis. Long lead times, new financing models, negligible marginal costs and the absence of terrestrial last-mile complications look set to deliver sustained growth over the coming years according to the latest industry projections, which remain optimistic at around 7-8% annual growth in revenues for the next five years (**Insight 13**) and 50% growth over the next decade (**Insight 14**). Satellite operators can take advantage of both corporate financing in their own name as well as and project financing, and are exploring new financing mechanisms. Growing consumer and government demand and new applications are set to drive steady demand over the medium-term (**Insight 14**).

The difficulties in finding funding now faced by some telcos have threatened to derail investment in NGNs, but some governments have been quick to step in including ICT infrastructure in their stimulus plans to protect the roll-out of NGNs and leverage growth in ICT infrastructure in support of their long-term economic growth and development goals. Overall, this Report concludes that the ICT sector has a major role to play in generating economic growth and stimulating economic recovery to bring the global economic slowdown to an end.

2. A Story of



Crash, Crunch and Crisis

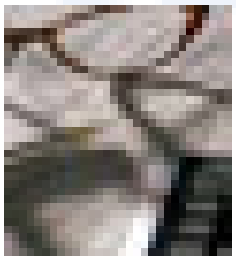
2.1 Economic Outlook - Is the End in Sight?

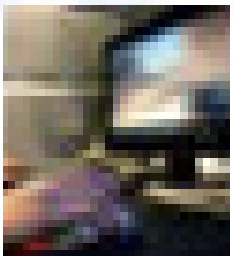
The origins of the current financial crisis in the US property market crash and ensuing credit crunch are by now well-known[1], although not always well-understood. A crisis that originated in the market for sub-prime mortgages in the United States has shaken the global financial sector to its foundations and sent many industrialized economies spinning into recession, while slowing growth in major emerging markets.

The size and scale of the global economic slowdown have proved staggering. At one point, virtually every major OECD economy was officially in recession[2] (with at least two successive quarters of negative growth on record), with the sole exception of Australia.[3] A financial crisis on this scale has not been witnessed since the Great Depression (**Insight 1**).

Recent growth forecasts for the global economy have been mixed - the World Bank revised its growth projections downwards in June 2009 to a contraction of 3% for 2009 citing persistent risks,[4] but the IMF revised its April projections upwards in July 2009 to -1.4%, on the basis of a more moderate rate of decline in economic activity.[5] The OECD also raised its projections of economic activity for the OECD in June, attributing the slowdown in the fall of activity to inventory adjustment, recovery in non-OECD countries, some return of business confidence and policy stimulus providing greater support.[6] However, economic recovery is not anticipated before the end of 2009 at the earliest, while all these institutions are united in their agreement that recovery will be weak, slow and uneven.

Indeed, the most lasting legacy of the crisis may well be for employment - in the US, recent analysis of employment figures by the Economic Policy Institute suggests that nearly nine years of jobs' growth have been wiped out.[7] The UN International Labour Office (ILO) predicts that globally, some 50 million jobs could be lost over the current financial downturn by end 2009. The ILO has advocated a "Global Jobs Pact", calling on governments to work with unions and employers to implement crisis-response measures to sustain enterprises and





accelerate job creation, while strengthening social safety nets. Long after financial markets stabilize, workers may be left still counting the cost, as the financial crisis leaves behind a more enduring "jobs crisis" in countries around the world.

The speed of transmission of the economic malaise to different economies has also been exceptionally rapid. Globalization and the pooling of risk in toxic 'mortgage-backed securities' have weakened investment and commercial banks around the world[8], necessitating state intervention and the forced recapitalization of a number of major banks. In some countries, a private debt crisis has now become a public debt crisis, with government debt growing rapidly - in some advanced economies, levels of government debt are now approaching their highest levels since World War Two[9].

Amidst the turmoil, policy-makers have scrambled to respond with various measures to curtail the downturn and promote recovery. Governments have launched massive economic stimulus plans to boost demand and employment in a reapplication of Keynes' ideas for our times (**Insight 2**), whilst also engaging in monetarist responses, the like and scale of which have never been seen before. Governments have committed to capital injections, issued debt guarantees and coordinated interest rate cuts in an effort to restore liquidity and boost their economies with a counter-cyclical stimulus. In the US, the Federal Reserve has boosted bank reserves and switched to asset purchases and credit programmes as its main policy tools[10], while the Bank of England has engaged in quantitative easing.

The IMF notes that policy-makers are now challenged with skillfully navigating between avoiding an early withdrawal of fiscal stimulus that could curtail economic recovery, whilst trying to avoid levels of public debt that could cause concerns about fiscal sustainability[11]. Debate over the respective role of the public and private sector has, to some extent, been superseded by the need for action, as public attention now focuses on stimulus plans to promote economic recovery.

Insight 1: Recession or Depression?

Economists have compared this crisis with other historical events for insights into transmission mechanisms and policy lessons as to how policy-makers can best combat current economic challenges. **Figure 1** compares the economic crisis with the Great Depression.

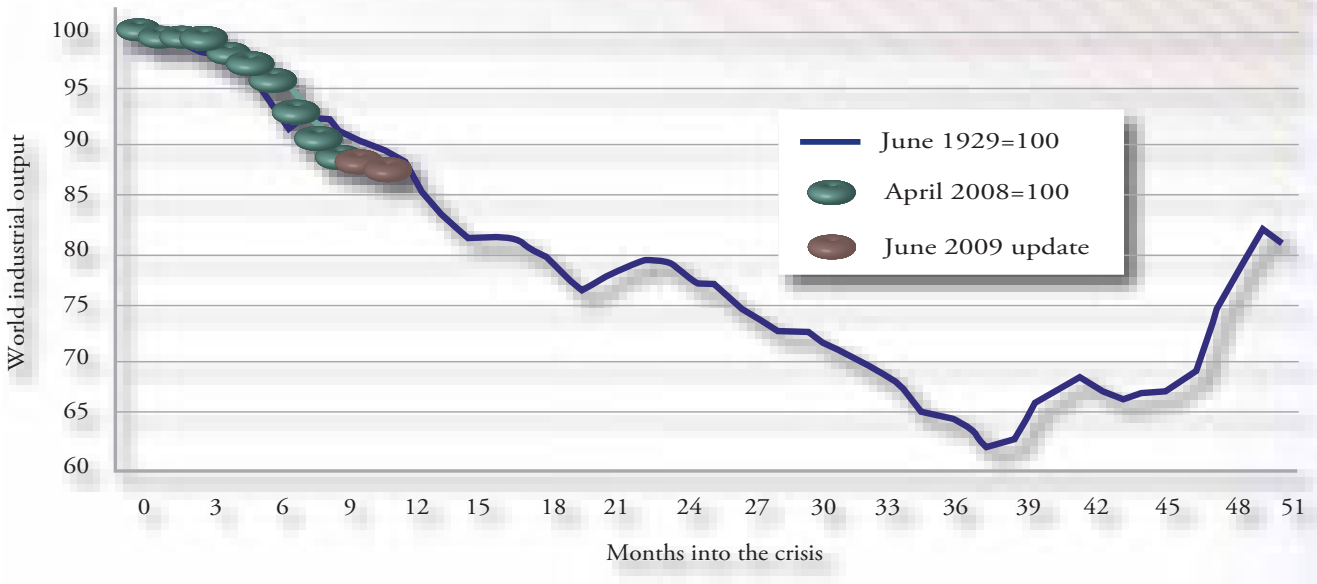
Figure 1 shows that global industrial production tracks the fall in the 1930s, with no clear signs of 'green shoots'. The decline in industrial production over the last nine months is as severe as in the nine months following the peak in 1929 (**Figure 1** tracks behavior after the peaks in world industrial production, which occurred in June 1929 and April 2008 respectively).

The global economy is tracking or doing even worse than the Great Depression, whether the metric is industrial production, exports or equity valuations. Focusing on the US causes one to minimize this fact. That said, we are presently only one year into the current crisis, whereas after 1929, the world economy continued to shrink for three successive years. What matters now is that policy-makers arrest the decline.

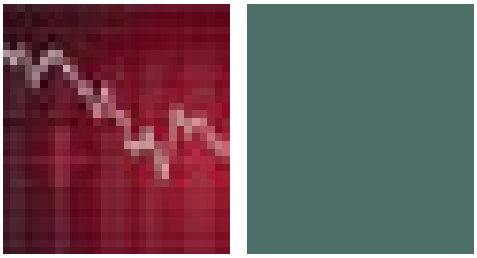
Source: "A Tale of Two Economic Depressions", Market Oracle, 23 June 2009: http://www.marketoracle.co.uk/Article11516.html

World Industrial Output, Now versus Then

Figure 1



Source: Eichengreen & O'Rourke (2009), IMF. Note: Data show global industrial production for 1929/30 and 2008/09.

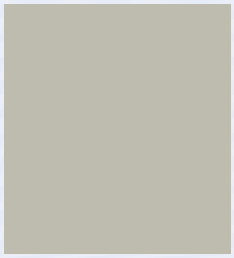


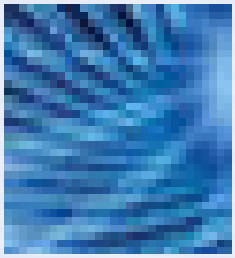
2.2. Policy Responses to Recession

If there is little precedence for the scale and speed of the economic slowdown, the policy response is clearly unprecedented. The IMF notes that policy-makers around the world have responded using a range of measures, including large-scale fiscal stimulus, accommodative monetary policy and support for the financial sector. The IMF concludes that "the speed and magnitude of the policy response [has] played a key role in beginning to turn around market sentiment, in slowing the decline in economic activity, and in truncating downside risks"[12] and observes signs of recovery visible in some emerging markets (particularly Asia), although the nascent recovery is still struggling to become established in most advanced economies.

Budgetary support, low policy interest rates and steeper yield curves have helped strengthen financial institutions' earnings and balance sheets, but in some economies, there is little evidence that such stimulus measures have succeeded in restoring lending to the private sector or even boosting the money supply.[13] Monetary policy has had some success in normalizing conditions in money markets, but has had less influence over longer term interest rates.[14] Interest rates have been cut to historically low levels in many countries,[15] but there is still a lack of readily available credit, as banks impose more stringent requirements on individual and business borrowers. Funding issues are likely to persist until the banking sector is recapitalized and losses on impaired assets are recognized fully.

In direct response to the crisis, more than fifty countries have launched economic stimulus plans (**Insight 4**) to boost aggregate demand (**Insight 2**).[16] The OECD records as many as 25 out of 30 OECD countries as having launched stimulus plans (**Figure 2**). Stimulus plans represent a trade-off or compromise between immediate measures that can be implemented quickly to fuel economic recovery and creating the long-term conditions favorable for promoting economic growth. The US Congressional Budget Office (CBO) study, "Options for Responding to Short-Term Economic Weakness",[17] published in January 2008 laid out three principles for effective stimulus, which the economist Menzie Chinn characterized as "timely, targeted and temporary".[18]





In terms of which measures are the most effective for stimulus, the US Economic Policy Institute (EPI) notes that evidence suggests that public investment and direct government spending are more effective than tax rebates for stimulating an economy. Investment in public works projects may take longer to implement, but is more likely to spur robust activity. On this basis, some economists have argued that fiscal stimulus aimed at stabilizing the economy over the short- to medium-term should focus on infrastructure spending, aid to municipal government and increases in unemployment insurance. [19]

Initiatives that can be carried out rapidly (e.g. tax cuts) may be less effective at generating long-term jobs and economic growth.[20] For example, EPI notes that tax cuts have generally not proved effective in generating jobs.[21] Of the US$ 100 billion in personal tax rebates that the US established as part of its broader economic stimulus effort in 2008, EPI predicts that only about one-third of this amount is likely to actually be spent. EPI forecasts that less than half the personal tax cuts are likely to be spent in the first two years, with most of the money gained used to pay down debt, build savings or buy imports - uses that do not necessarily boost an economy. A University of Michigan study published in December 2008 also concluded that tax rebates provide little 'bang for the buck' as economic stimulus. [22]

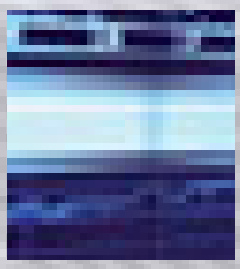
According to the OECD, the United States has launched the largest economic stimulus plan of any country, amounting to some US$ 787 billion in total. **Figure 2** depicts the size of known fiscal plans and their composition for OECD countries in early summer 2009 (although many of these plans are still awaiting ratification and implementation). The OECD notes that non-OECD countries are also introducing significant economic stimulus plans e.g. China (US$ 585 billion or 19% of GDP), Brazil (US$ 152 billion or 15% of GDP), Russia (US$ 101 billion or 8% of GDP), Chile (US$ 4 billion or 2.8% of GDP), although definite figures are difficult to identify or verify for most of these cases. These plans may represent entirely new budget allocations or they may represent reallocation of expenditures that were already planned prior to the financial crisis.

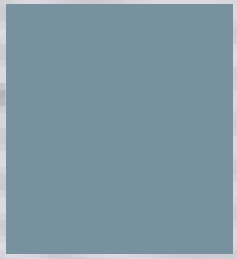
Insight 2: Keynes For Our Times - The Rationale for Stimulus Plans

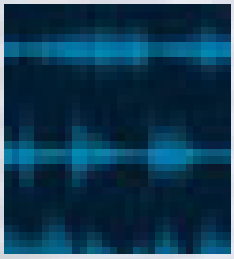
Keynes' central insight was that government policies can be used to boost aggregate demand, thereby increasing economic activity and reducing unemployment. He argued that responses to depression should stimulate the economy with an inducement to invest through a combination of two approaches: a reduction in interest rates and government investment in infrastructure.

Investment by government boosts workers' incomes, resulting in more spending in the general economy, thereby stimulating production and investment, and resulting in more income and spending. The original stimulus investment initiates a virtuous circle of economic activity, with the total effect some multiple of the original investment.

Perhaps the most famous demand management programme of all time is President Roosevelt's New Deal, which helped restore employment during the Great Depression (although some economists argue it did not ultimately put an end to the Depression). In one of his fireside chats, President Roosevelt suggested that it was up to the government to "create an economic upturn", by making "definite additions to the purchasing power of the nation".[23] At the time however, proponents of the New Deal were not typically associated with Keynesian arguments for government spending as a vehicle for recovery, as they favored balanced budgets. The New Deal did in fact engage in deficit spending since at least 1933, but the Democratic party was typically apologetic about this, because the rise in national debt opposed its party philosophy.



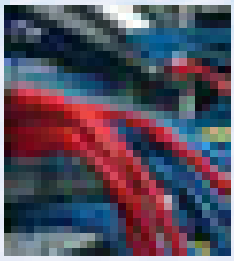




Policy-makers ever since have experimented with Keynesian economics to combat recessions. Professor Jeff Frankel of Harvard University notes that John F. Kennedy was the first President to deliberately experiment with Keynesian economics, using deficit spending and the 'Kennedy tax cut' to stimulate economic growth. However, he observes that by the time this tax cut took effect, the 1961 recession was already over. The experience of the Kennedy tax cut suggests that, even if Keynesian fiscal response can theoretically help moderate or end recessions, political lags and other time lags for the stimulus measures to take effect can pose significant difficulties in practice. Prof. Frankel further notes that tax cuts and increased spending under Ronald Reagan were the most powerful factors pulling the US out of the 1981/2 recession – although this fiscal stimulus was not done with Keynesian intentions, it had Keynesian effects.

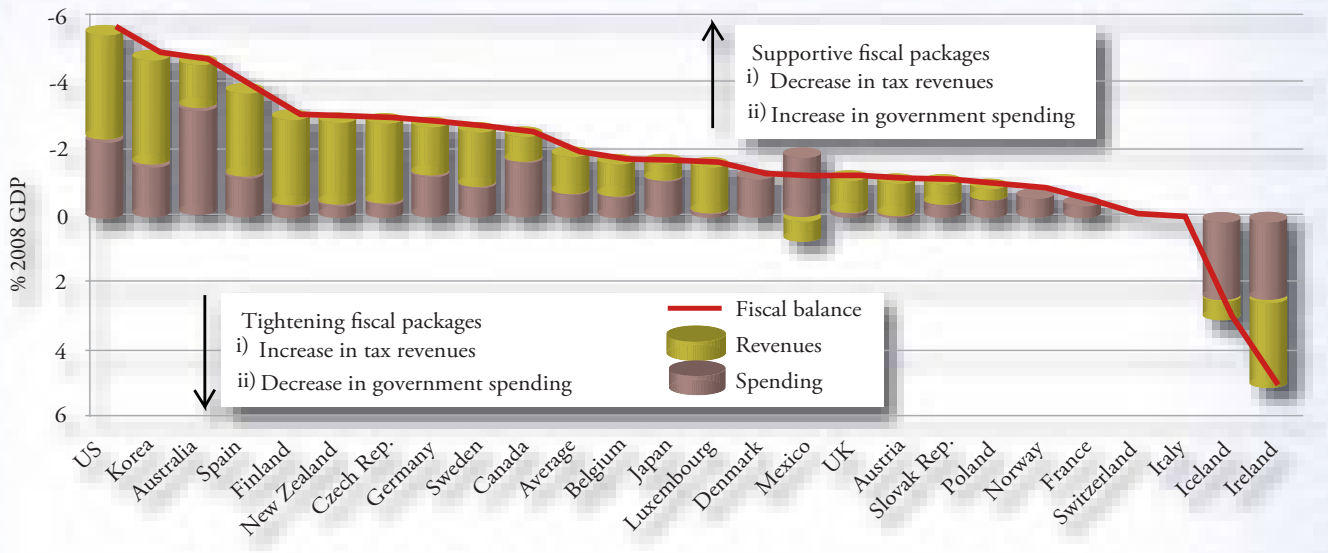
For our times, investment in high-speed broadband networks is viewed as the modern-day parallel to the Roosevelt Administration's investments in rural electrification programmes and highways. The Internet is a global public good, offering public and network externalities that are likely to be sizeable. Broadband Internet access is a key enabling platform for many advanced applications and participation in the modern information society. It is suggested that access to broadband Internet boosts productivity growth, cuts transactions costs, can improve business and market organization and may promote more efficient social and political discourse and education - see **Section 3.1** on the Role of ICTs and Broadband in Stimulus.

Source: ITU, supplemented with material from "How the Government Dealt with Past Recessions", New York Times, 26 January 2009, at: http://www.nytimes.com/interactive/2009/01/26/business/economy/20090126-recessions-graphic.html.

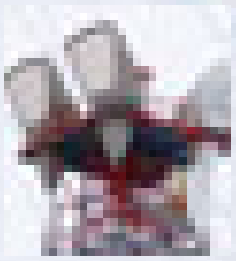


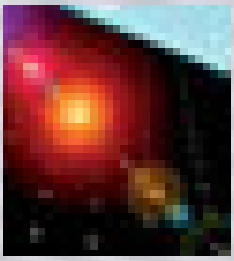
Implementation of the announced stimulus measures has so far proved slow, however, and has yet to be carried out in many countries, with actual spending of announced stimulus measures relatively low in many cases. In the US, for example, the IMF notes that payroll tax cuts were implemented relatively quickly, but only US$ 46 billion or 11% of authorized spending measures had taken place by mid-May 2009, concentrated in health and welfare services.[24] Some policy-makers in countries with extensive automatic fiscal stabilizers (e.g. social benefits and unemployment benefits) have argued that these inherent built-in stimulus measures can help stabilize their economies during an economic downturn, so these countries may not need explicit additional legislation[25] or stimulus plans[26] in response to the recession.

Figure 2 Impact of fiscal packages over 2008-2010 on fiscal balances



Source: OECD 2009, First Interim Report on the OECD's Strategic Response to the Financial & Economic Crisis, C (2009)26.





Insight 3: Economic Stimulus Packages & the ICT Sector

Governments in OECD countries are setting up economic stimulus packages to address the economic crisis. These affect the ICT sector in direct and indirect ways. The immediate aim of these packages is to restore the health of the banking sector and stimulate demand in the short-term, i.e. re-financing banks, injecting cash into the economy and protecting existing jobs. These measures may help counteract negative demand pressures on the ICT sector and help sustain the diffusion of ICTs. However, most governments also plan to foster growth through investments with repercussions on the supply-side, helping to restore favorable conditions for innovation and long-term economic growth. In many cases, these long-term plans are directly related to the ICT sector or ICT applications (e.g. "smart" applications in urban systems, transport systems, electricity distribution, etc.), potentially providing an anti-cyclical stimulus to the sector. The question is how should current ICT policies be maintained or rethought during the economic crisis and what is the right balance between continuity and proven ICT policies on the one hand and more rapid *ad hoc* crisis measures on the other hand.

Source: OECD (2009), "The Impact of the Crisis on ICTs and their Role in the Recovery", available from http://www.oecd.org.

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Stimulus Plans and e Global ICT Industry

3.1 What Role for ICTs & Broadband in Stimulus?

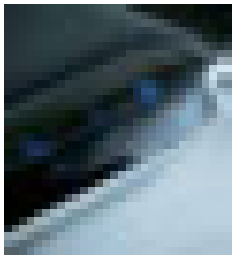
Justifications for ICT Investments in Stimulus Plans

The justification for including investments in ICT infrastructure in current stimulus plans is that access to the Internet is vital for the participation of firms and organizations in today's information economy, as well as the provision of many online e-government services. The OECD (2009a) suggests that new ICT infrastructure investments are good targets for stimulus spending, because these projects typically represent shovel-ready investments that "can minimize economic leakages and may promise stronger marginal impacts on supply and productivity than investing in established networks such as electricity, gas, water and transportation".[27] Broadband networks in particular represent the information super-highways of today's online economy (see next Section).

In these recessionary times, however, governments are under growing pressure to invest funds strategically for the future to create more jobs and make their economies more competitive in the long-term (**Insight** 4). The ICT sector is viewed as a strategic sector where strong positive externalities mean that the total returns to investment easily justify initial outlays.

Historically, there is also a large body of research supporting positive economic returns and strong externalities to investment in ICTs. Investment is a consistent driver of economic growth in regression work e.g. Hardy (1980) & Norton (1992) – however, these studies failed to allow for two-way causation. After allowing for two-way causation ("endogeneity") and time lags, Roller & Waverman (1996)[28] found strong positive growth effects of investment in telecommunications, with a 10% rise in fixed-line penetration resulting in a 2.8% rise in GDP. Waverman, Meschi & Fuss (2005) found a similar positive and significant impact of mobile telephony on economic growth in developing countries. Booz & Company 2009 found that a 10% higher broadband penetration in any year is correlated with a 1.5% increase in labour productivity over the following five years.

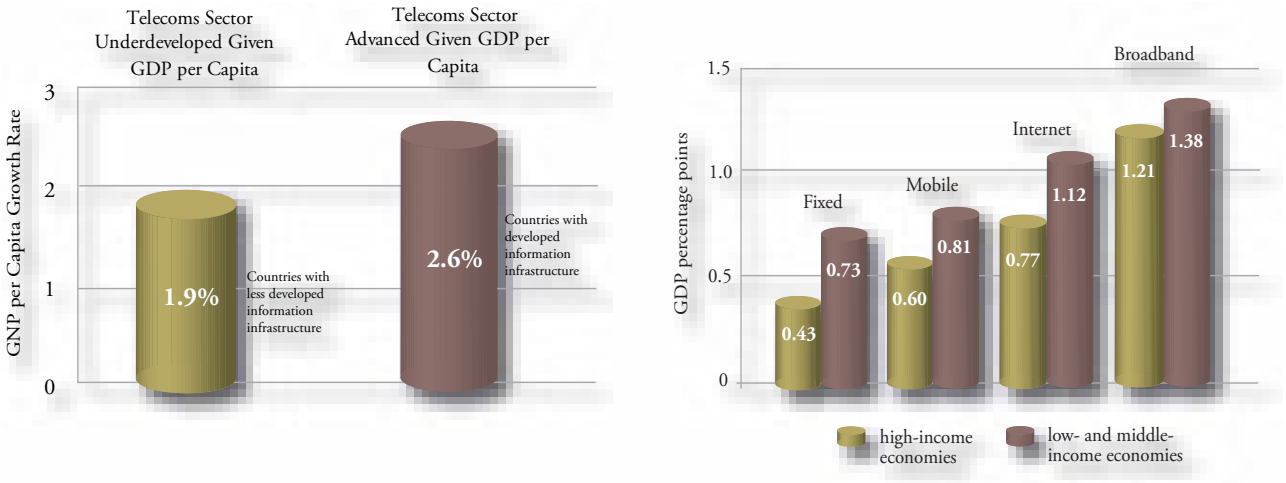
Many of these studies distinguish between high-income and low-income economies as structurally



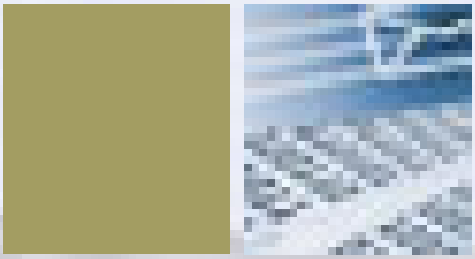
different (**Figure 3**). Some authors have suggested that raising ICT penetration has greater beneficial growth impact for developed countries, given their more service-oriented economies and educated workforce ready to make intensive use of ICTs. However, other authors contend that ICTs could have a greater growth impact in developing countries, once critical network penetration is achieved e.g. World Bank (2009) - see **right chart, Figure 3**.

However, most of this research is based in more 'ordinary' economic times. It is not clear whether investments in ICTs in recessionary times have the same impact on growth, no matter how large-scale these investments may be - some commentators agree that economic multipliers for government stimulus investments are likely to be lower during a recession.[29] Nevertheless, on the basis of strong economic returns to investment, many stimulus plans have prioritized investments in modern communication infrastructure to support the roll-out of new services and generate jobs.

Figure 3 The Growth Impact of Information Infrastructure



Source: Left chart - GICT MNA Working Paper (2003); right chart - Qiang (2009) and "Information and Communication for Development Report 2009", World Bank (2009).



Insight 4: The Impact of the Economic Crisis on ICTs and their Role in Recovery

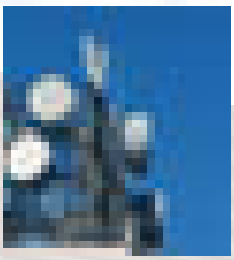
The global economic crisis has intensified pressure on governments around the world to develop stimulus programs that will result in creating jobs and create revenue. In response to this pressure, some countries are focusing almost exclusively on traditional industries such as manufacturing, textiles and automotives and may be overlooking the impact from investments in the growing ICT sector.

ICT investments can positively impact jobs, productivity, revenue growth and innovation. A few specific effects of investments in the ICT infrastructure may include the creation of high-skilled, high-paying jobs, stronger, more competitive businesses and improved international competitiveness. In the US, a 7% increase in broadband adoption could potentially result in a projected 2.4 million annual increase in jobs in the US, with a US$ 134 billion economic impact per year (Connected Nation report 2008).

There are over 50 countries with stimulus programmes with an estimated total spending of over US$ 3 trillion. Countries can choose to spend their money "strategically" to create jobs now and for the future or spend their money as they have traditionally spent it. A few countries like China, Australia, Portugal, Turkey, India, Brazil, US and others have chosen to spend their stimulus dollars to enhance their education systems, build out broadband and reduce VAT on technology products. In other words, they are spending "strategically" to increase their economies for today and tomorrow.

Virtually all countries have some type of ICT infrastructure; therefore, going forward countries should focus on spending in strategic areas:

- Manufacturing: 3D simulations to build, test and prototype products;
- Construction: 3D simulations to model and build energy-efficient buildings;
- Transportation: Railroads with high-tech control centers and smart railcars;
- Energy: "Smart" grids for business buildings and homes to monitor and adjust usage;



- Broadband: the 21st century infrastructure for everyone; and
- Education: 21st century skills.

Governments can help create a suitable environment for growth. This may include changing legislative policies to be friendly toward ICTs, making it easier for business and consumers to invest in ICTs, providing universal access to the Internet by investing in broadband and encouraging innovation in technology. Countries that spend "strategically" today will find themselves more competitive tomorrow.

Source: John Davies, Vice-President Sales & Marketing & General Manager, Intel World Ahead Program, Intel Corp

> The bottom line is, you can't function — a nation can't compete in the 21st century — without an immediate, high-quality access for everything from streaming video to information overline. Getting broadband to every American is a priority for this Administration.

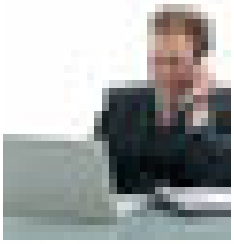
Source: US Vice-President Joe Biden, addressing Seneca High School on 1 July 2009, quoted at: http://www.latimes.com/news/nationworld/politics/wire/sns-ap-us-biden-stimulus-broadband,1,4779748.story

Justifications for Broadband Investments in Stimulus Plans

Access to broadband Internet in particular is argued to boost productivity growth and competitiveness, cut transaction costs, improve business and market organization and promote more efficient social discourse and education. In his excellent paper, "The Case for a National Broadband Policy", Atkinson (2007) suggests that broadband is different from other technologies in two key ways[30]. Firstly, broadband is not just a consumer technology, it is "prosumer" technology that enables consumers to become producers, driving innovation and to economic growth. Broadband is essential for access to many advanced applications, for video streaming and teleconferencing. Indeed, the ultimate true value of "Web 2.0" lies in users being able to generate, as well as access, content and develop their own applications, innovations and software in order to reap the benefits of collective intelligence and crowd sourcing.

Secondly, information is a public good (**Insight 5**) and broadband exhibits positive network externalities with benefits not only to individual consumers, but also to other users and society as a whole. Atkinson identifies network externalities, investment externalities, competitiveness externalities and regional externalities. Owing to these externalities, the social returns from investing in broadband infrastructure exceed the private individual returns of companies and consumers, so market forces alone will underestimate and fail to generate the socially-optimal level of broadband.

This explains why a growing number of countries now include broadband in their definitions of universal access/service, according to the ITU's annual TREG survey (for example, countries as diverse as Canada, Ghana, Guinea, Nigeria, Morocco, Saudi Arabia, Sudan, Switzerland and the US). Some groups in the US have even argued that broadband Internet access is a basic precursor for economic justice.[31] These externalities mean that it is essential to see investments in next-generation broadband as part of a nation's broader overall economic strategy, rather than a concern only for sector regulators (**Insight 6**).



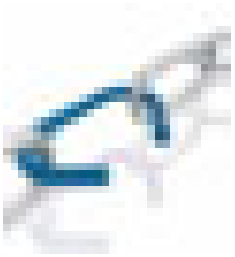
Insight 5: Information as a Public Good – Why Broadband? Why Government?

Broadband is a key driver of economic growth and national competitiveness. Recent World Bank research suggests that the contribution of broadband to economic growth is substantial and may be greater than narrowband or voice-based ICTs, providing a boost of 1.38% to GDP growth in developing countries for every 10% increase in broadband penetration (**Figure 3**). Broadband is transforming the way in which we live and work – companies are now using broadband to improve productivity through remote monitoring, logistics management and online procurement and to provide services such as e-commerce and e-banking.

Broadband is also a key means of accessing information in developed countries. Although broadband itself does not fulfil the classic criteria of the definition of a public good, it provides access to information, which is a public good and is essential to all forms of economic activity and good governance. Broadband provides access to new technologies and allows companies to explore new business opportunities, access customers and obtain information about market prices. Better access to information makes markets function more efficiently and raises producer incomes. Greater access to information about the performance of government helps improve government accountability and governance. Broadband networks are increasingly being used to deliver public services such as financial services, healthcare and e-voting.

Despite rapid recent growth, broadband is still in its early stages. The future will see wider deployment, greater capacities and a shift towards wireless platforms to enable mobility. Broadband in developing countries will follow a similar path, but with greater emphasis on wireless networks. Expanding affordable access to broadband is becoming a high priority for governments of developed and developing countries.

How is this best achieved, and what should be the role of government in the provision of broadband? The basic principle is that government should only intervene based on sound economic principles and where the benefits of intervention outweigh the costs. There are two different roles for the public



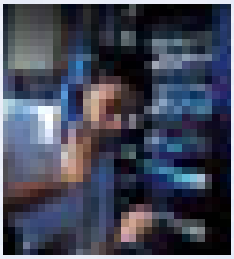
sector – helping markets function more efficiently and ensuring social objectives are met with equitable access for all (efficiency and equity).

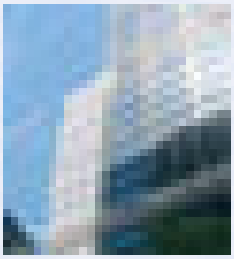
Current market failures in the provision of broadband include difficulties in obtaining permits to operate, inefficient allocation of radio-spectrum, poor information and limited capital markets. In many countries, the dominance of incumbent operators arising from their historical monopoly may stifle competition. These market failures have been widely recognized by governments around the world and can be addressed through regulatory policy including liberalizing licensing regimes, facilitating efficient access to radio-spectrum and regulating access to dominant operators' networks ("unbundling the local loop"). In some countries, there are even positive financial incentives for operators to invest and compete (e.g. Rep. of Korea). Others have provided low-cost access to existing energy and transport networks.

Many governments have also taken a pro-active approach to boosting network roll-out in rural and underserved areas. Historically, this was achieved through cross-subsidization by the state-owned monopoly operator. Following market liberalization, this approach has been replaced by explicit subsidy mechanisms such as Universal Service Funds. As public and private service delivery increasingly shifts online, however, the inability of some parts of the population to get access to broadband becomes more of a public policy problem, if balanced development is to be achieved. This has led governments to consider a more active approach to ensuring broadband is available throughout their territories.

Most recently, broadband is now featuring in fiscal stimulus plans around the world. Australia has committed around US$ 3 billion, while the US administration has set aside US$ 7.2 billion for rural broadband. Broadband is seen as a positive addition to these stimulus plans because, on the supply side, it stimulates investment and employment, while on the demand side, it creates opportunities for entrepreneurship and spill-over effects that benefit the broader general economy.

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





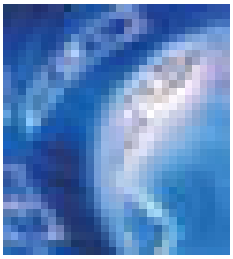
Strategic Networks Group (SNG) found a real and positive growth impact to investments in broadband. In addition to building basic infrastructure, broadband investments offer large multiplier effects (**Table 1**). An economic multiplier means that a dollar's worth of initial government expenditure is "multiplied" up by repeated rounds of income-spending, so the ultimate end impact of the investment is far greater than the initial dollar's worth of government spending.

Using input-output impact models, SNG found that secondary investments driven by broadband can be ten times as high as the initial investment, while their contribution to GDP could be fifteen times the initial amount - healthy multipliers to initial investment that still leave considerable margin for reduction, even during a major recession, when reduced consumer spending or "leakages" from open economies in the form of imports may reduce multipliers from their usual levels. [32]

Table 1: Impact of Investments in Broadband Infrastructure - for Canada and the UK

Impact of Investment in Broadband Infrastructure	Case study of investment in community broadband infrastructure	Case study of investment in e-learning, telemedicine & broadband
Initial Investment in broadband infrastructure by government	USD 10 million	USD 10 million
Leveraged Investment (from other sources - private sector, municipal authorities, etc.)	USD 116 million	USD 101 million
Total Investment	USD 126 million	USD 111 million
Contribution to GDP from total investment	USD 164 million	USD 150 million
Contribution to Total Employment*	2,100 jobs	4,800 jobs
Contribution to Taxes*	USD 61 million	USD 32 million
**Note – impact on employment & taxes varies by types of jobs & investment made.*	*SNG (2003) for DTI, UK Government.*	*SNG (2004) for Industry Canada.*

Source: Strategic Networks Group (SNG), at http://sngroup.centraldesktop.com/sngpublic#_ftn1



Insight 6: Choosing the Right Degree of Government Involvement

Critics of governmental involvement and investment in infrastructure say that government is ill-trained to understand the market dynamics, productivity-boosting possibilities and some of the other features of the private operators that often provide telecommunication services. Although this may be true, there are also market weaknesses delaying the deployment of the networks needed to meet market demand. This is a situation suited for public policy-makers – with the right focus and use of resources, they can break down the barriers to next-generation broadband infrastructure development.

The key is to see next-generation broadband as part of an economic strategy, rather than a concern only for sector regulators. In the digitally-linked global economy, the ability of citizens and business to compete will depend greatly on their access to information. For mature economies, especially those experiencing a rapid shrinking in their formerly dominant industrial sectors, the twin imperatives of the digital economy are speed and access, and next-generation broadband has the potential to offer both, at levels never before imagined. Those nations taking the first step in seizing the opportunities of next-generation broadband may not always be the most efficient nor always the most successful in deployment, but they will surely be better off than those nations that remain on the sidelines, paralyzed either by fear, cost or the unknown.

Source: Booz & Company (2009), "Digital Highways: The Role of Government in 21st-Century Infrastructure", written by Roman Friedrich, Karim Sabbagh, Bahjat El-Darwiche and Milind Singh.

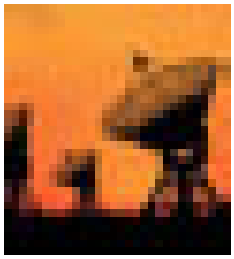
As businesses benefit from broadband in greater profitability and competitiveness, they expand, boosting local employment, local spending and investment in facilities and equipment. These secondary economic effects take longer to materialize, but may have greater impact in the long run, as productivity, competitiveness and services improve. There are important secondary returns to investments in broadband infrastructure for improving skills, service delivery and efficiency.

Indeed, there are likely to be substantial employment benefits to investments in ICT infrastructure. The London School of Economics and Information Technology and Innovation Foundation estimate that investing in certain types of ICT infrastructure offers superior job creation benefits because it can create a network effect. This network effect results in an additional employment growth multiplier (the "network multiplier"), which arises from the new consumer and business spending, functionality and downstream employment generated by the original investment in ICT. These arise because digital infrastructures act as platforms serving as the foundation for a host of innovative new technologies and services. Estimates for the UK show that investments of GBP 15 billion (US$ 10.4 billion) in network infrastructures over one year could create or retain upwards of one million jobs (**Table 2**).

Table 2: UK Jobs Created or Retained by Investments in Network Infrastructures

ICT Investment	Amount Invested	General Jobs	Small Business Jobs
Broadband networks	GBP 5 billion	280,500	94,000
Integrated Transport Systems (ITS)	GBP 5 billion	188,500	120,000
Smart power grid	GBP 5 billion	231,000	146,000
Total	GBP 15 billion	700,000	360,000

Source: LSE and the Information Technology & Innovation Foundation.



These secondary returns mean that broadband investments probably deserve more attention than they have received to date in terms of stimulus plans - of the US$ 787 billion that makes up the American Recovery and Reinvestment Act 2009, some US$ 7.2 billion or less than 1% has been allocated for funding a variety of broadband initiatives throughout the US. Canada's stimulus package devotes a similar proportion of its total funding to broadband projects. Yet the significant externalities and secondary returns to investments in broadband suggest that broadband deployments could justify even greater investments.

Broadband e-business applications can help firms to expand their market reach, explore new revenue opportunities and build local linkages. Businesses can also become more efficient and cost-effective (e.g., using triple-play broadband to cut calling costs or teleconferencing to cut travel budgets). Addressing local broadband infrastructure gaps and accelerating adoption of e-business solutions are fundamental to promoting regional economic development that is built on competitive businesses and skilled human resources. Addressing broadband gaps in coverage, capacity and quality of service could prove critical to the long-term prosperity of hitherto underserved communities.

The Internet is also a sizeable sector in its own right. A recent Interactive Advertising Bureau (IAB) report estimated that, in the United States, the birthplace of the Internet, the Internet sector accounts for some US$ 300 billion in economic activity or 2.1% of total US GDP and 3.1 million jobs, in over 20,000 Internet-related firms providing a range of services such as web design, publishing and software consulting throughout the US.[33] The IAB concludes that the Internet is "not only vital infrastructure, it is a spur to entrepreneurship and social change - it has changed the way firms find customers, customers find information and people manage social relationships".

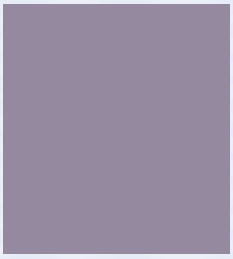
In reality, we are probably only at the start of what broadband can achieve – broadband has generated an explosion of information growing at an exponential rate. The information-sharing capabilities of broadband will fundamentally transform how firms learn and interact, while creating new opportunities for adding value in innovative new business models, original services and fresh approaches. Broadband

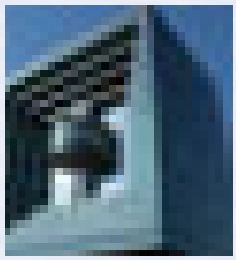
Internet access is driving greater availability of converged services, such as Voice over Internet Protocol (VoIP) and IPTV. Firms and organizations need to learn how to move from using basic broadband connectivity towards truly effective participation in the digital economy.

Based on the growth and productivity benefits of ICTs, many OECD governments have now launched national broadband stimulus plans – see the Government stimulus plans announced in **Table 3** and **Figure 5**, often as part of broader economic recovery plans. These plans are very recent, dating from 2008 or early 2009. Some plans update or extend existing national broadband schemes that have been planned for some time (e.g., Australia's National Broadband Plan and Ireland's National Broadband Scheme). Most importantly, Government plans have often been developed in parallel with the existing investment plans of many operators and incumbents (see **Table 3**).

The financial crisis has cut directly across the NGN upgrade and roll-out plans of many incumbent operators in Europe and Asia, some of which have been underway since 2002-2004. Some operators insist that the financial crisis has not affected their investment plans in any way - for example, British Telecom (BT), Telecom Italia and Slovak Telecom have all stated publicly that the financial crisis has not yet affected their investment plans. However, some other operators have either cut their capital expenditure (for example, the Spanish incumbent Telefonica cut its capex by -7.2% in 2008) or recognized that future investment plans depend on cooperation with public authorities – as is the case with Telekomunikacja Polska in Poland. In some countries, there have been direct calls for greater government involvement in the telecom sector following the financial crisis – there have been calls from the industry for greater government involvement in Nigeria, for example. [34]

Booz & Company (2009) note that despite consumer and business demand and the desire for increased national competitiveness, NGN fibre broadband network deployments to date have been limited, with the top fifteen countries comprising mainly OECD economies. They note that "although operators may still be considering tactical urban deployments of NGNs, they are reluctant to consider nationwide deployments, particularly in light of the current economic crisis". [35] This view suggests that operators could respond to the current limitations on funds by



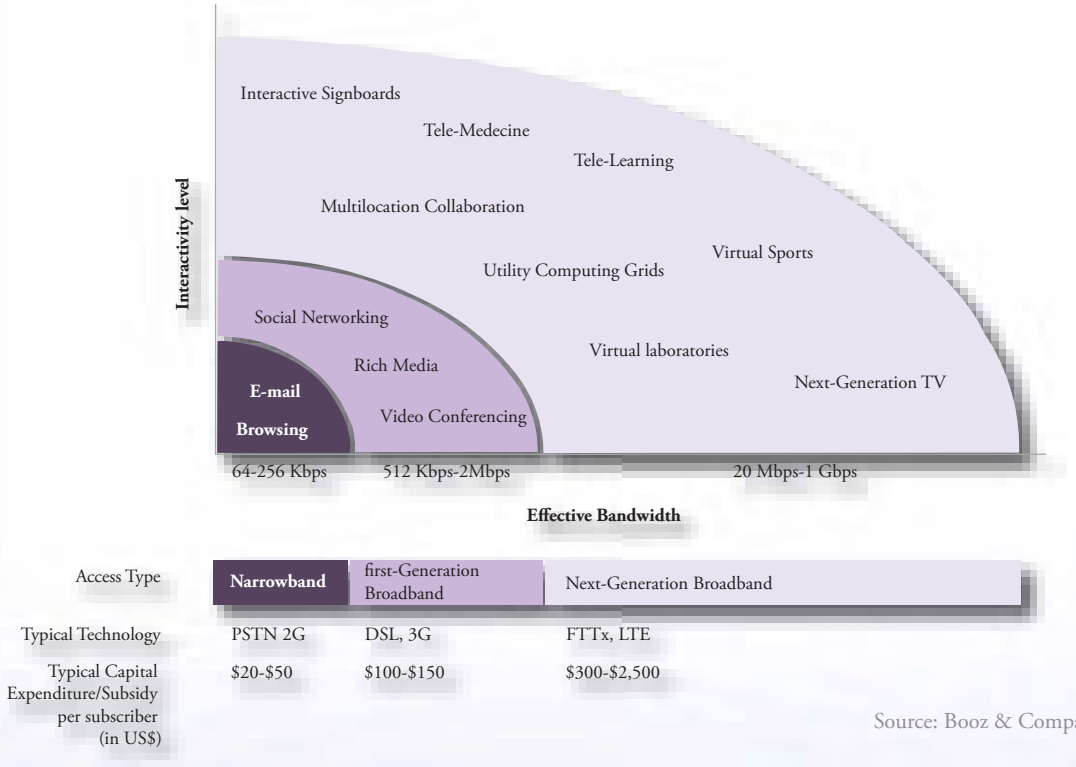


curtailing investment plans and cherry-picking profitable areas, with adverse consequences for universal service objectives.

Stimulus plans will obviously play a major role in revitalizing the ICT industry, given the size and scope of the investments announced. However, it is important to note that despite their scale and the publicity surrounding them, the amounts announced in the stimulus plans are in fact dwarfed by the hundreds of billions of dollars that the existing broadband industry has already invested in broadband networks and services, amounting to far more than announced in any stimulus plan to date. On this basis, the US National Cable & Telecommunications Association (NCTA) has emphasized that stimulus funds should be deployed in a manner that will not harm the existing broadband industry.[36]

Not All Broadband is Created Equal

Figure 4



Source: Booz & Company (2009).

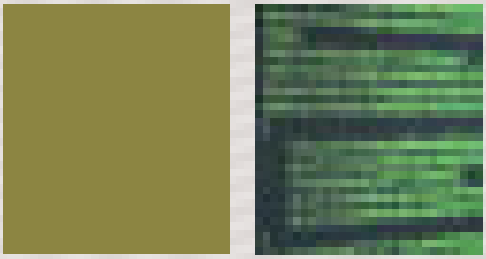


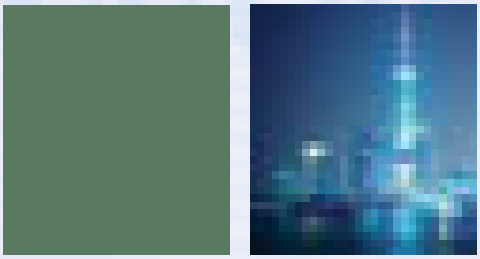
Table 3: selected Operators Investment Plans for ICT Infrastructure and National Stimulus Plans

Country	Announced	Date	Investment	Goals and Targets	Speeds
Austria	Telekom Austria	2004	EUR 780m (US$ 1,130m)	Full conversion of core to NGN started in 2004; to be completed by 2012	20 Mbps
Australia	Government	2008	US$ 3 bn	Fibre all the way to the premises for 90% Australians	100 Mbps
Australia	Telstra	Nov 2005	AU$ 10 bn	IP core network by 2007-2010 for 90% HHs in 8 yrs	100 Mbps
Belgium	Belgacom	2007	647m EUR	High-speed Broadway project for IP/MPLS network 2008-12 for 80% homes	100 Mbps
Canada	Government	Jan 2009	CAD 225m (US$ 211m)	BB coverage for unserved rural & remote communities over 3 years	N/A
Denmark	TDC	2006	N/A	TDC will establish NGN single IP-based network for 75% HHs 2009, 90% HHs 2010, 75% HHs 2010	20 Mbps 20 Mbps 100 Mbps
Finland	Government	Sept 2008	EUR 200m (US$ 291m) in PPP	Extending ultra-fast broadband for 100% HHs by 2016	1 Mbps 2010; 100 Mbps 2016
France	Government		N/A	Access to BB by 2010; mobile broadband by 2012 for all	N/A
France	France Telecom	Jan 2006	EUR 3-4.5 bn (US$ 4-6.6 bn) by 2012	1m HHs passed with fibre in 2008; 4m HHs passed in 2012	N/A
EU	European Commission	Nov 2008	EUR 1 bn (US$ 1.46 bn)	100% coverage of high-speed Internet by 2010, focusing on rural communities	N/A
Germany	Government	2009	EUR 150m (US$ 219 m)	Nationwide capable BB access no later than end 2010. 2010- unserved areas. By 2014, 75% HHs broadband	Target 50 Mbps
Germany	Deutsche Telekom	2005	EUR 3 bn (US$4.4 bn)	PSTN to be fully substituted by 2010 VDSL & HDTV for 30% HHs with 50 Mbps	50 Mbps VDSL and FTTC
Greece	Government	Sept 2008	2.1 bn EUR (US$ 3 bn)	Tender for fibre network roll-out for seven years from 2009/2010	100 Mbps FTTH/B
Ireland	Government	2009	EUR 223m (US$ 318m)	Universal broadband coverage by Sept 2010	1.2 Mbps
Ireland	Eircom	2006	EUR 60m upgrade	Migrate NGN core network and deploy fibre network in towns	1-24 Mbps
Italy	Telecom Italia	2006	EUR 60m over 2007-2017	Migration of access network to NGN for 98.5% population broadband 5.2% fibre 2009	4 -100 Mbps
Japan	Government	Sept 2008 April 2009	Y 37.1 billion (US$ 395 m)	ITS, improving IT infrastructure, training IT staff & new industries, with BB roll-out to rural areas	N/A

Country	Announced	Date	Investment	Goals and Targets	Speeds
Korea, Rep.	Government	Feb 2009	US$ 890m	Increase national broadband infrastructure speeds tenfold by 2012	1 Gbps by 2012
Latvia	Lattelecom	2009	N/A	Plans to replace DSL by FTTH 2009-2012, FTTH under trial in some cities	100 Mbps 500 Mbps
Luxembourg			EUR 195m (US$ 285m)	Accelerating build out of Luxconnect highway	N/A
Netherlands	KPN	2005 - NGN 2008 - FTTH	EUR 6-7 bn	Migration of network to NGN - all IP backbone planned for 2010	N/A
New Zealand	Government	March 2009	NZ$ 1.5 bn state; private?	Ultra-fast broadband by 2019; 75% population coverage	Fibre
Norway	Telenor	2005 - NGN 2007 - FTTH	N/A	Core IP MPLS network by 2010, using PON, DSL and WiMAX for full coverage	FTTH
Poland	Telekom. Polska (TP)	Sept 2008 – NGN & FTTx	EUR 400m	TP is investing in passive optic networks from 2009-2011	50 Mbps
Portugal	Government	Jan 2009	EUR 800 m (US$ 1,168 m)	Subsidized investments optic fibre for 1.5m users in NGN networks	N/A
Singapore	Government	2007 - 2008	SG$ 1 bn (US$ 710m)	NGN Broadband Network to cover 60% premises by 2010 and 95% premises by 2012	1 Gbps+
Slovak Rep.	Slovak Telekom	2004	N/A	Digital NGN core network & overlay for 40% HHs by 2010	Fibre
Spain	Government	2008	N/A	Installing next generation fibre and regulating broadband	Up to 30 Mbps
Spain	Telefónica	May 2006	EUR 1 bn	Investing in next generation FTTx with 40% population coverage in 2009	25 Mbps
Sweden	TeliaSonera	End 2004	SEK 200m (US$ 28m)	Multiple operators moving to IP and IMS core networks; National target of BB for all HHs by 2010	10 Mbps
UK	Government	Jan 2009	To be announced	Universal service commitment for BB for virtually every community by 2012	2 Mbps by 2012.
UK	BT	2004	GBP 1.5 bn (US$ 2.2 bn)	BT launched 21st Century Network in 2004 and its super-fast broadband plan in Openreach in mid-2008 for 40% or 10m HHs	40-100 Mbps
US	Government	2009	US$ 7.2 bn	To foster BB service to unserved/underserved areas, schools, libraries, health providers etc.	No set minimum

Sources: Qiang (2009), OECD (2009), Dr. Vaiva Lazauskaite (2009), Booz & Company (2009).

Note: Currency equivalents are presented in original form, so as not to distort the sources, so USD conversions do not all use the same exchange rate.



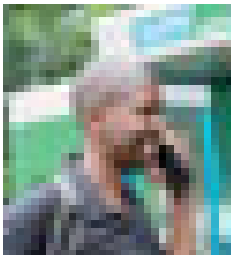
The Phoenix Center in the US notes that the value of broadband has typically been evaluated by numerical counts of its availability (e.g. subscribers) and notes that the true value of broadband access to a society varies by user, connection speed and method of access – parameters where the existing stimulus plans to date have all varied considerably. [37] In fact, taking into account the various and sizeable externalities associated with broadband means that the social returns are likely to exceed the private returns, so the true social value of broadband is likely to be understated (**Section 3.1**).

Broadband stimulus plans have focused on providing broadband (sometimes at specified speeds, using specified technologies) to various priority groups or communities. Countries have varied in the boldness of their targets in coverage and speeds, which are obviously related to the technology/technologies chosen (**Figure 5**). Some countries (e.g. Finland and Germany) have set staged targets for achieving specified levels of coverage by certain dates. Denmark has staged its targets in terms of speeds and coverage.

Other countries have made universal service for broadband Internet a policy priority – for example, the UK's Digital Britain Plan envisages 100% coverage of rural areas with 2 Mbps broadband service, while both France and EU are seeking to provide universal coverage of broadband Internet access. Countries differ in whether targets are population coverage, household coverage or by locality. Targets are clearly related to arguments of 'picking technologies' and 'picking communities'.

In reality, targets should be linked to usage for greatest efficiency in the use and deployment of networks – see, for example, **Figure 4**, which relates the speed of broadband access to usage. Booz & Company (2009) note that speeds of up to 100 Mbps are needed for some telemedicine and distance learning applications, compared to 4-6 Mbps required for web-based teleconferencing. The UK's Digital Britain plan established the speed for universal service broadband as 2Mbit/s+, in part as the minimum speed required to deliver iPlayer, the British Broadcasting Corporation's national TV service over the Internet (Deloitte, 2009).

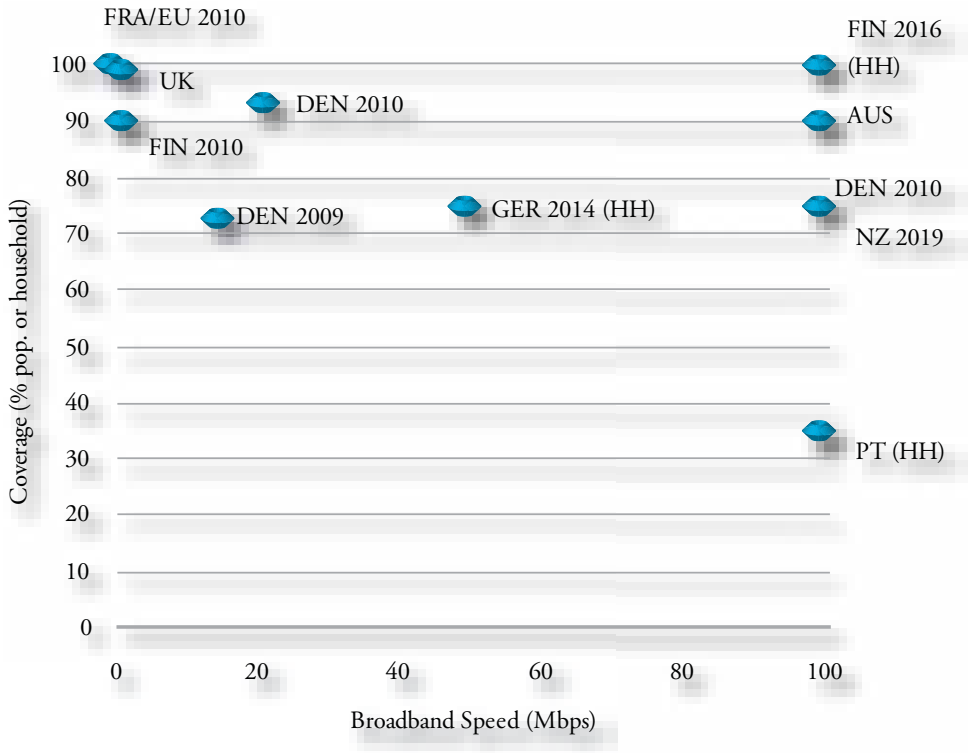
The advantage of setting national targets for coverage and broadband speed is that it provides a clear signal by Government of its commitment towards establishing the foundations for a modern information economy with advanced infrastructure and access



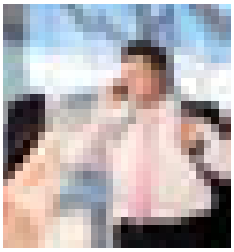
technologies. National targets can also amount to a type of universal service obligation, ranking communities and individuals equally and embodying social objectives in the provision of telecommunication services (e.g. for poorer communities or rural areas). However, national targets may represent a rather blunt tool that may fail to take into account the needs and geography of certain areas. Individual operators can set targets that are tailored towards the use of specific technologies to meet the needs of specific markets or specific geographies in certain areas (e.g. urban, rural) – for example, in Clearwire's selection of new markets for the deployment of mobile broadband in certain areas of the US. [38]

Figure 5

Targets Announced in Stimulus Plans to Date



Source: ITU. Note: HH = household, with the target specifying household coverage.



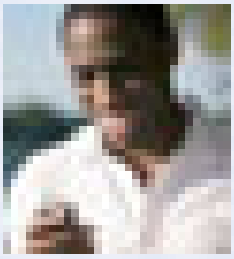
Picking Technologies

In the recently published *Guidelines for the use of US stimulus funds*, [39] the US Government explicitly endorsed technology-neutrality, on the basis that the State should not pick technological winners and losers – "the standards chosen are technologically-neutral and appropriate for the widest range of applications, because the definition of reasonable network management may differ based on the technology used and other dimensions of the project". [40]

In Australia also, the Broadband Guarantee Program has deliberately avoided picking technologies and seeks to channel state funds into leveling the playing field for all service providers and not into any specific technology choice. To "un-tilt" the playing field, the Australian Government will give a subsidy per subscriber to whichever provider. For satellite services, the research consultancy Northern Sky Research notes that this could mean subsidizing equipment and installation costs, as well as the subscription. Northern Sky Research concludes that the important point is that subsidies are linked to signing up subscribers, and not to the costs of service provision.[41] The greater the number of subscribers signing up, the more subsidies are received – hence the competitive incentive. Northern Sky Research suggests that the ultimate goal is that service providers commit to supplying a metropolitan-equivalent service, and that rural subscribers should pay roughly the same, as if they were metropolitan subscribers.

Some commentators believe that stimulus plans in some countries emphasize wireline infrastructure at the expense of wireless. Ericsson notes that governments are supporting the roll-out of FTTx, which may or may not be appropriate in a future where broadband connections will be mostly mobile. Fibre delivers far greater bandwidth (greater by a multiple of around ten than the nearest, most advanced wireless technology), but High-Speed Downlink Packet Access (HSDPA) and Long Term Evolution (LTE) have proved cost-effective ways to connect rural areas with high bandwidth, multi-megabit data connections, building off and extending the reach of the national fibre backbone to underserved areas.

Network investments are nearly always front-loaded, with high initial outlays. Mobile deployments require lower initial outlays than fixed networks (especially for upgrades to existing networks or where infra-



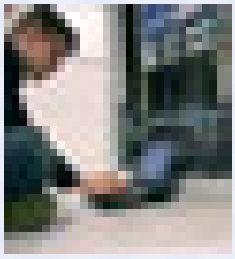
structure-sharing strategies can be used) and can take as little as 18-24 months to become profitable and justify the initial investment, particularly in high-growth emerging markets. Wireless deployments have thus become the domain of the private sector, but government support for fixed infrastructure may not be fully aligned with a mobile broadband future.

Network investments are also a major business bet, in the absence of any clearly superior technology and while regulatory regimes for NGN are still evolving. The different competing wireline technologies available mean that investors and operators are often reluctant to invest solely in one technology. Fibre plant is a more future-proof investment than copper, because copper plant cannot deliver the same throughput as fibre. Copper-based broadband also typically has higher operating costs than fibre, although initial outlays may be less.

In response, many operators are hedging their bets and investing in a range of next-generation technologies to mitigate the risks posed by technological change. The UK's British Telecom, Germany's Deut-

> The key factor to remember [....] is that it is not about asking your engineers which is the best technology [...], it is all about economies of scale; if we don't find the global economies of scale, we don't achieve affordability, we don't reach the low cost of equipment, we don't reach the low cost of devices, we don't have the ecosystem necessary to support roll-out, not only in Sweden or Portugal or US or Japan, but in rural Africa.

Source: Ulf Pehrsson, Vice President, Government and Industry Relations, Ericsson, Strategic Dialogue Panel 4 at 39:00 available at: http://www.itu.int/ibs/wtpf/2009/sd/

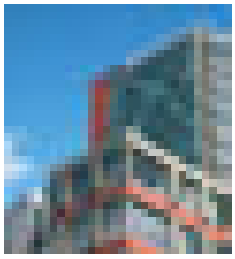


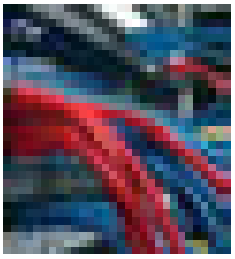
> We see a lot of government support for rolling out FTTx, but they get carried away with the idea of trying to connect all homes. They forget that in the near future, 80% of broadband connections will be mobile... Fibre and mobile broadband are two parts of the same solution.

Michael Bjarhov, Asia-Pacific Director of Government and Industry Relations, Ericsson, speaking at the Next-Generation Broadband Forum Summit at CommunicAsia'09 - http://www.communicasia.com/show_daily/SHOW%20DAILY%20Day4.pdf.

sche Telekom and Norway's Telenor are all pursuing a range of technologies in their upgrade plans in **Table 3**, for example. British Telecom was recently criticized for a possible lack of coherence between BT Wholesale's IP-based 21st Century Network plan and BT Openreach's work to develop fibre technology. However, in response, BT has affirmed that "no single NGN provides the perfect solution for every channel partner or every customer"[42] and has underlined its commitment to both projects.

Even if governments do not 'pick technologies', there are concerns that state-funded stimulus plans implicitly end up picking winners. Large-scale subsidies, funding and credit lines for backbone network construction could implicitly favour the established incumbent operators, at the expense of competitors and the rest of the industry. The consequences for competition and tilting the competitive playing field are far from clear, in the United States and other countries.





Picking Communities – Urban Versus Rural

The returns and commercial viability of broadband networks also depend heavily on the area in which they are deployed. Ericsson's experience suggests that over 70-80% of investment in a typical Fibre-To-The Home (FTTH) network (not including back-haul and transport networks) is in passive plant and civil construction, with a large proportion of this amount is in providing the final drop (up to 300m) to the premises.[43] The cost per household of deploying FTTH is estimated to be between US$ 300-2,500 depending on geography, which Heavy Reading notes "will limit mass roll-out in certain countries".[44] However, mass roll-out is what is needed - deployments of copper and fibre are most easily justified in urban areas, where high population density and a large base of willing, educated subscribers with higher average incomes offer the prospect of greater margins.

Broadband networks (like mobile and other network investments) need fast and widespread deployment to attract take-up and amortize their fixed costs over a mass-market base of business, government, and residential subscribers. Failure to achieve sufficient scale quickly results in a high-cost operation which is not commercially sustainable and does not yield the full economic returns. [45]

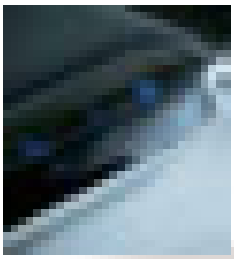
The investments needed for FTTx networks are very large indeed, while FTTx could cost up to six times more to deploy in rural areas than for urban, high population-density areas [46] (although Booz & Co (2009) estimate the cost of deploying fibre to rural areas to be only double that of urban areas). According to an EU analysis, up to EUR 300 billion (US$ 375 billion) might be needed to upgrade existing access networks in the EU to fibre.[47] Investment totalling EUR 250 billion (US$ 313 billion) might be needed to roll out fibre networks in the original 15 EU Member States, with deployment costing from EUR 1,000 (US$ 1,252) per customer in urban areas, to EUR 6,000 (US$ 7,510) per customer in rural areas.[48] Based on the experience of the UK, Analysys Mason notes that deployment costs of Fibre-To-The-Cabinet (FTTC) are constant across high population density areas, but much higher in more sparsely populated areas, highlighting the need for creative thinking about how to make rural areas more attractive to investment.[49]

To address urban/rural differences in provision, broadband universal service obligations are one option; national broadband policies and state in-

volvement in the planning, financing and roll-out of broadband are other possibilities (either through Universal Service Funds or Public-Private Partnerships at the national or municipal level). Fresh approaches and more imaginative funding schemes and/or state involvement have been incorporated into some stimulus plans.

For example, of the US$ 787 billion planned for the American Recovery and Reinvestment Act 2009, the US Commerce Department's National Telecommunications and Information Administration (NTIA) has been given US$ 4.4 billion to extend broadband and wireless services to rural, suburban and urban areas, while another US$ 2.8 billion goes to the Department of Agriculture's Rural Utilities Service (RUS) to expand broadband access to rural areas. Guidelines have recently been released with the definitions of unserved and underserved areas (**Insight 7**). Rural models of coupling fibre backbones with broadband wireless access could be adopted more widely to ensure the most widespread broadband deployment, even during a financial crisis. Infrastructure-sharing and open access strategies could also help keep costs down.

Sweden has also allocated US$ 250 million in grants specifically for rural communities that did not yet have broadband service to build local broadband networks, with further US$ 250 million was available in tax relief for building out the networks. The procurement process has to be open and operator-neutral, while municipalities had to provide at least 10% of the cost of building the network with government support limited to a one-off subsidy for five-year contracts. [50]



Insight 7: ARRA Broadband Investment Program Guidelines of USDA – RUS Issued 9 July 2009

The Rural Utilities Service (RUS) will support the expansion of broadband services in rural areas in the United States through financing and grants to projects that provide access to high-speed services and facilitate economic development in locations without sufficient access to such services.

Strategy:

In order to provide economic stimulus during the current recession, ARRA requests that funds be obligated by 30 September 2010. RUS will offer grants, direct loans and loan/grant combinations. These funds will be awarded on a competitive basis with unprecedented transparency and accountability.

Objectives:

1. Fund projects that will support rural economic development and job creation beyond the immediate construction and operations of the broadband facilities.
2. Ensure that at least 75% of the investment serves rural areas.
3. Implement in concert with NTIA and construction with the FCC.
4. Establish appropriate monitoring and servicing of the investments to ensure that the objectives are achieved.

The ARRA includes the following requirements for broadband projects funded by RUS under the bill: 75% of areas to be served by a project receiving funds from such grants or loans shall be in a rural area without sufficient access to high-speed broadband services to facilitate rural economic development.

Priority shall be given to:

- Projects that will deliver end-users a choice of more than one service provider;
- Projects that provide service to the highest percentage of rural residents that do not have access to broadband services;
- Projects from current and former RUS borrowers;
- Projects that can commence immediately upon approval.

Source: http//:www.scribd.com/doc/16345490/ARRA-Broadband-Investment-Program-Guidelines-of-USDARUS-Issued-060909.

3.2. The Changing Face of Financing – Is Government Back?

After two decades of privatization and greater private sector participation in the industry (**Figure 6**), one of the most lasting consequences of stimulus plans for the ICT industry could be the return of greater state involvement in the funding of ICT infrastructure. The lack of readily available financing, higher financing costs and lower risk thresholds for many operators relative to the size and scale of long-term financing needed to fund network roll-out is making corporate financing increasingly difficult and there are calls for government to assist in investments in next-generation networks.

Infonetics Research projects that global service provider capital expenditure (capex) peaked in 2008 at US$ 298 billion, but will decline sharply by 2.8% in 2009, with service providers significantly reducing equipment spending.[51] They foresee a better second half to 2009, pulled along by resilient service provider demand and increased competition. Global service provider revenue is expected to weather the economic storm and grow from US$ 1.7 trillion in 2008 to US$ 2 trillion in 2013.

Infonetics projects that mobile operator capex will continue to dominate total global telecommunication and data communications spending, while the consultancy A. T. Kearney forecasts that the mobile industry alone will invest US$ 800 billion over the next five years.

However, operators cannot postpone investment in traffic-burdened networks to maintain high-quality service indefinitely, as they risk losing customers to competitors. Infonetics Research predicts a flat 2010 and slow return to growth in 2011 with the start of a new investment cycle. Another survey by Infonetics Research for North America suggests that North American companies expect to maintain their voice communications expenses and may not slash their budgets, as feared by many in the industry.[52]

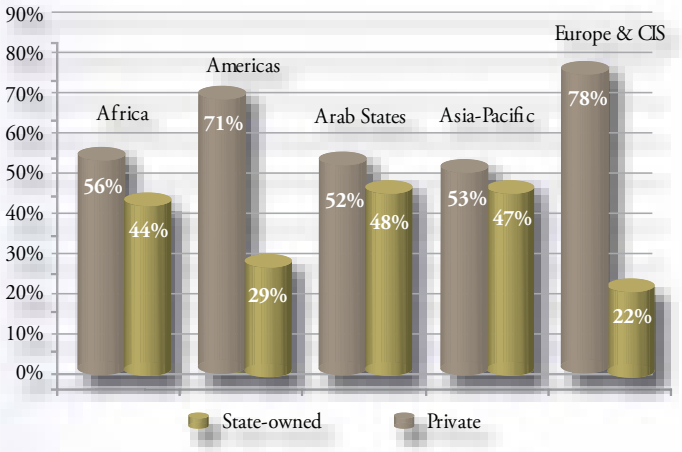
However, service providers that have not made investments during good economic times are less likely to do so during an economic slowdown. Furthermore, local or regional authorities may lack the financial or human resources to make investments in broadband infrastructure. The World Bank notes that there is not enough public sector money to solve the global crisis,[53] so recovery strategies are needed that encourage private business and financing as well.

In the face of these challenges to corporate financing, governments in some countries are now providing advantageous financing terms to fund the roll-out of fibre and NGN deployments. They are also experimenting with innovative new financing models to fund network deployments in new technologies. Indeed, some stimulus plans and existing broadband plans focus on financing plans for investment in ICT infrastructure, while recognizing that deployment is best carried out by the private sector.

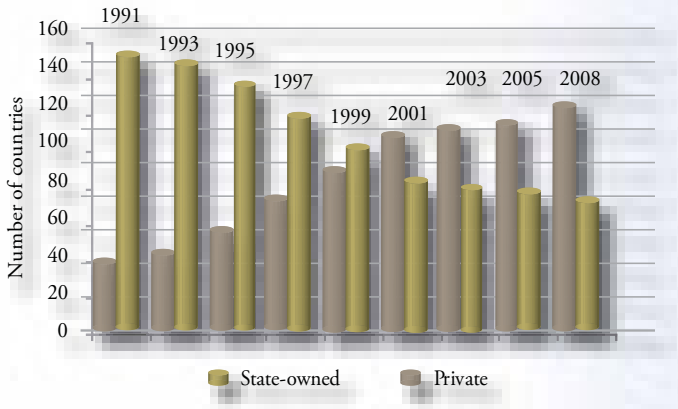
Public-Private Ownership of Incumbent Operators, 1991-2008

Figure 6

Status of the Main Fixed-Line Incumbent, 2008



Public/Private Ownership Worldwide, 1991-2008



Source: ITU World Telecommunication Regulatory Database.

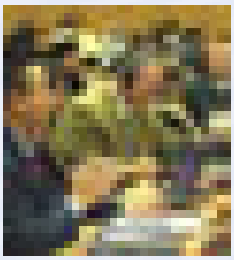
The open investment model of the Ministry of Economic Development of New Zealand is one example. In March 2009, the Ministry announced its plan to deliver ultra-fast broadband to 75% of New Zealand's population by 2019.[54] The Government has proposed the establishment of a Crown-owned investment company ("Crown Fibre Investment Co" or CFIC). CFIC will invest alongside the private sector as co-investors in regional fibre companies to deploy fibre optic network infrastructure in 25 towns and cities. CFIC will select local partners based on:

- The amount of additional fibre coverage proposed;
- The proposed capital structure;
- Commercial viability of the proposal;
- Consistency with government objectives; and
- The partner's track record.

This model seeks to provide government investment on favourable terms, while minimizing state involvement in commercial operations, which the New Zealand Government believes that "the private sector is better-positioned to direct".[55] The Government has committed up to NZ$ 1.5 billion for the roll-out on the basis that it expects this amount to be at least matched by private sector investment.

In Portugal, an agreement on the deployment of NGN was signed by the Government and four key operators (Portugal Telecom, Sonaecom, Zon and Oni Communications) in January 2009[56] as one measure in a EUR 2.18 billion stimulus plan announced in December 2008 to boost the economy.[57] The Portuguese Government has committed to opening up ducts for NGNs, more efficient regulation, maintaining a centralized information system and providing a credit line for at least EUR 800 million.[58] The Government hopes that the country's main telecom operators would invest EUR 1 billion in NGN roll-out during 2009. The protocol is open to every telecoms operator and aims to take NGNs to some 1.5 million homes by end 2009. However, some operators are reluctant to invest immediately – for example, Vodafone Portugal considers that, in its case, the required conditions to invest in NGNs are not yet met and has not yet signed the agreement. [59]

Timeframes for investment are critical. Indeed, the lags between the initial stimulus and the time for any investment to take place are significant. It is not clear when the spending for such projects - and hence the stimulus to the economy - would ultimately occur (referred to as "an outside policy lag"). If economic

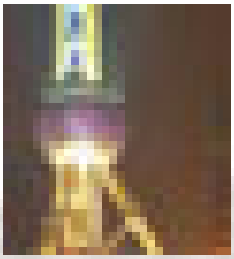


recovery is slow, timing could work out perfectly, giving the economy a jolt just as faster-acting components wear off. If there is a rapid rebound, many publicly-funded work projects could start just in time to compete with renewed private spending (**Insight 8**).[60] This is one reason why the US stimulus plan places such emphasis on timely stimulus and immediate commencement of projects (**Insight** 7).

In some countries therefore, governments are therefore firmly back in the financing and funding of national telecommunication infrastructure. However, it is never sufficient for government just to provide financing – investments in infrastructure are the result of various complex business decisions that must be taken in context. Operators possess the fullest and most accurate information as to the size of potential market(s), their likely profitability and potential margins. They also possess the greatest experience in rolling out infrastructure to a range of markets. Some stimulus plans (including those of the Portuguese and New Zealand Governments described above) acknowledge that operational issues are best left to the private sector.

In fact, the focus of some stimulus plans on financing may be something of a distraction – governments (and regulators) should provide an overall enabling environment to facilitate investment through a range of more immediate supportive measures including reforms in the taxation of telecommunication revenues, promoting competition, creating greater regulatory certainty and liberating spectrum in the so-called "digital dividend" quickly.

Resolving outstanding spectrum issues could do much to promote private sector investment - for example, governments can accelerate the transition to digital TV to free up spectrum more quickly, simplify licensing procedures, optimize spectrum allocation through refarming or spectrum trading and/or promote colocation and infrastructure-sharing. There are a number of measures governments can undertake to promote greater investment despite a lack of readily available credit, either before or in addition to providing funding. This is especially important for developing countries with limited resources – the next Section examines the implications of these stimulus plans for developing countries.



Insight 8: Crowding Out or Crowding In?

Crowding out typically refers to any reductions in either private consumption or private investment that occur due to an increase in government spending. Government spending is perceived to use financial or other resources that might otherwise be used by private firms. In the crowding out of investment, greater borrowing by Government creates a greater demand for funds, which drives up interest rates and reduces rates of return and hence investment by the private sector (given a fixed level of money supply). This type of crowding out can in principle be mitigated by increasing money supply – e.g., by printing money. The crowding out effect can also be (partly) compensated for by government spending growing the market for private-sector products through the multiplier effect, thus stimulating or "crowding in" fixed investment.

Some stimulus plans have been carefully designed to specify their stance with respect to private sector investment. For example, the Government of New Zealand's national broadband plan specifically seeks to avoid "neither discouraging, nor substituting for, private sector investment" and "avoiding entrenching the position, or lining the pockets, of existing broadband network providers". It also seeks to avoid excessive infrastructure duplication and seeks to focus on building out new infrastructure, whilst not unduly preserving the "legacy assets" of the past.[61]

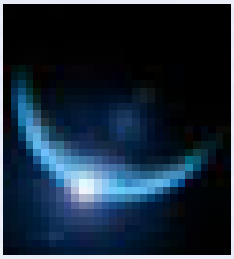
Source: ITU.

3.3 The Digital Divide & Developing Countries

What are the major implications of economic stimulus plans for developing countries? Developing countries have proved vulnerable to the knock-on effects on the economic slowdown through several channels – not only from the impact of job losses, but also from declines in exports, reductions in Foreign Direct Investment (FDI), falls in local stock markets and collapsing global demand for commodities. According to the World Bank, the reserves of some developing countries have now reached worryingly low levels (**Figure** 7), suggesting that some countries have limited resources to respond to the recession. Nevertheless, some countries have launched impressively large stimulus plans, including Chile, China and Malaysia.

China's stimulus plan of US$ 585 billion or 19% of GDP announced in November 2008 is large and aggressive. It will be used to ease credit restrictions, spend on agriculture, healthcare and social welfare services and launch an infrastructure spending programme covering ten areas, including the construction of new railways, projects aimed at environmental protection and technological innovation. These investments are in addition to the significant investments already being made in next-generation mobile and fixed broadband infrastructure.

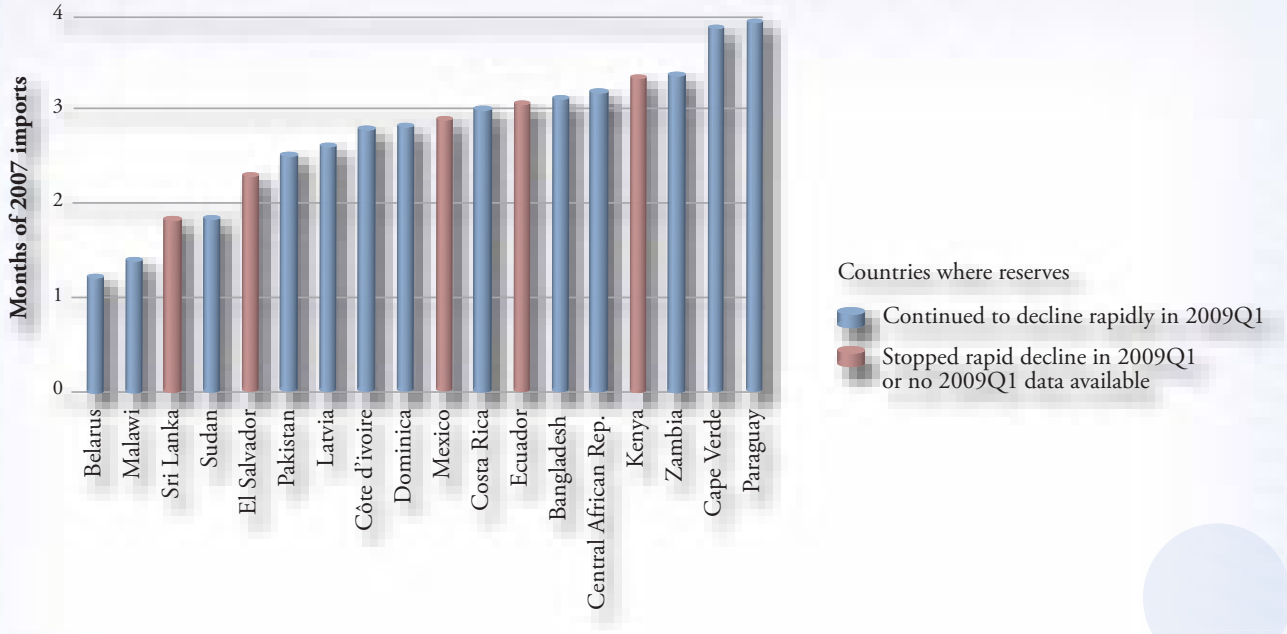
Malaysia launched a RM 7 billion (US$ 1.93 billion) stimulus plan of about 1% of GDP on 4 November 2008 in response to the crisis for projects with high multiplier effects including housing, transport infrastructure, public amenities, schools and hospitals. The construction sector has benefited the most from the stimulus plan.[62] In March 2009, this stimulus was enhanced by a second tranche of RM 60 billion (US$ 16.54 billion), equivalent to almost 9% of Malaysia's GDP, to be implemented over 2009-2010. This plan includes RM 15 billion (US$ 4.14 billion) in fiscal injections, RM 25 billion (US$ 6.89 billion) in guarantee funds, RM 10 billion (US$ 2.76 billion) for equity investments, RM 7 billion (US$ 1.93 billion) for private finance initiatives and RM 3 billion (US$ 0.8 billion) in tax incentives. Malaysia's investments focus explicitly on housing, transport infrastructure and skills.[63] ICT investments are not specifically included, probably because Malaysia has already invested heavily in universal access to ICTs over the last two decades.



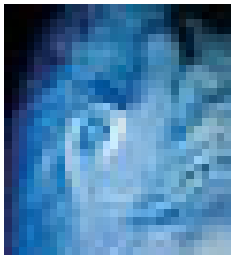
Brazil's stimulus plan has been going on for some time, since the Accelerated Growth Program of fiscal stimulus was first announced in 2007, before the financial crisis struck. It now includes a range of measures including monetary policy measures, tax exemptions, rebates and deductions. It also includes an investment of $221.4 billion earmarked for infrastructure building, mainly focused on the transport and energy sectors. Brazil has also invested heavily in ICT infrastructure and universal service requirements for ICTs since long before the global economic slowdown, including a Universal Service Fund.

It is not clear whether models and principles for stimulus plans developed in OECD countries are necessarily transferable to developing countries. For example, infrastructure development in developing countries could prioritize wireless technologies to

Figure 7 Developing Country Reserves have reached low levels



Source: World Bank Global Development Finance Report 2009.



leverage the high ratio of mobile subscribers found in many developing countries and maximize economic benefits. Indeed, the growth of homegrown technologies and development of inspiring new models in m-health and m-banking applications in Africa and elsewhere may offer reverse technology transfer for OECD stimulus plans.

Faced with global recession, however, many developing countries with limited reserves may be forced to focus on meeting more immediate needs - for example, in housing and sanitation infrastructure. If this does come to pass, the World Bank has raised the concern that developing countries may miss out on a rich development opportunity (**Insight 9**) in the

Insight 9: Promoting Broadband Infrastructure in Developing Countries

Currently few people in developing economies have access to broadband networks. In 2007, an average of less than 5% of the population of low-income economies was connected to broadband networks, mostly in urban centers. In this light, developing countries may be missing a great development opportunity of the economic benefits broadband infrastructure can bring. Several factors highlight the potential of broadband infrastructure as an important area of public investment during economic downturn, including:

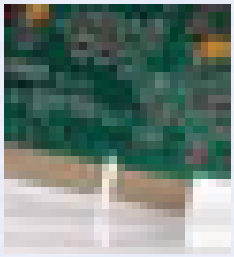
1) Delivering immediate employment and aggregate demand effects and network effects;

2) Bringing forward longer-term aggregate supply-side (spillover) effects which can improve the productivity of the entire economy;

3) 'Crowding in' private investment, when access to private financing is decreasing and more expensive.

Investments in broadband networks should also be a key part of the overall development strategies in developing countries. Achieving distributional policy objectives of reducing the digital divide and facilitating regional development through increased competitiveness are rationales for possible public intervention in broadband infrastructure.

Source: "Broadband Infrastructure Investment in Stimulus Packages: Relevance for Developing Countries", Qiang (2009).



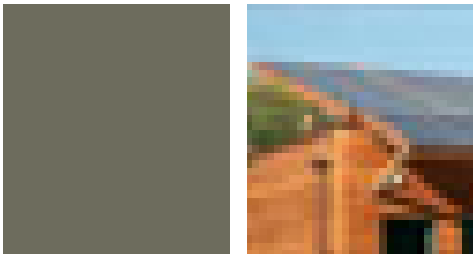
economic benefits conferred by broadband in immediate employment, spillover effects and spurring private investment.

Extensive broadband stimulus plans in OECD countries are likely to impact the digital divide, however. The roll-out of networks offering 50-100 Mbps bandwidth in many OECD countries could reshape the digital divide in terms of relative Internet access speeds in comparison to developing countries.

ITU has monitored trends in access to broadband Internet and broadband speeds and prices for more than 200 countries around the world since 2003. The good news is that, even before broadband stimulus plans were announced (or implemented), the number of countries with fixed broadband Internet commercially available has grown steadily, from just 81 countries in 2002 to 182 countries in 2008 (**Figure 8, top chart**). Ever-growing consumer demand for greater bandwidth is pressurizing companies into investing in broadband and rolling out FTTH.

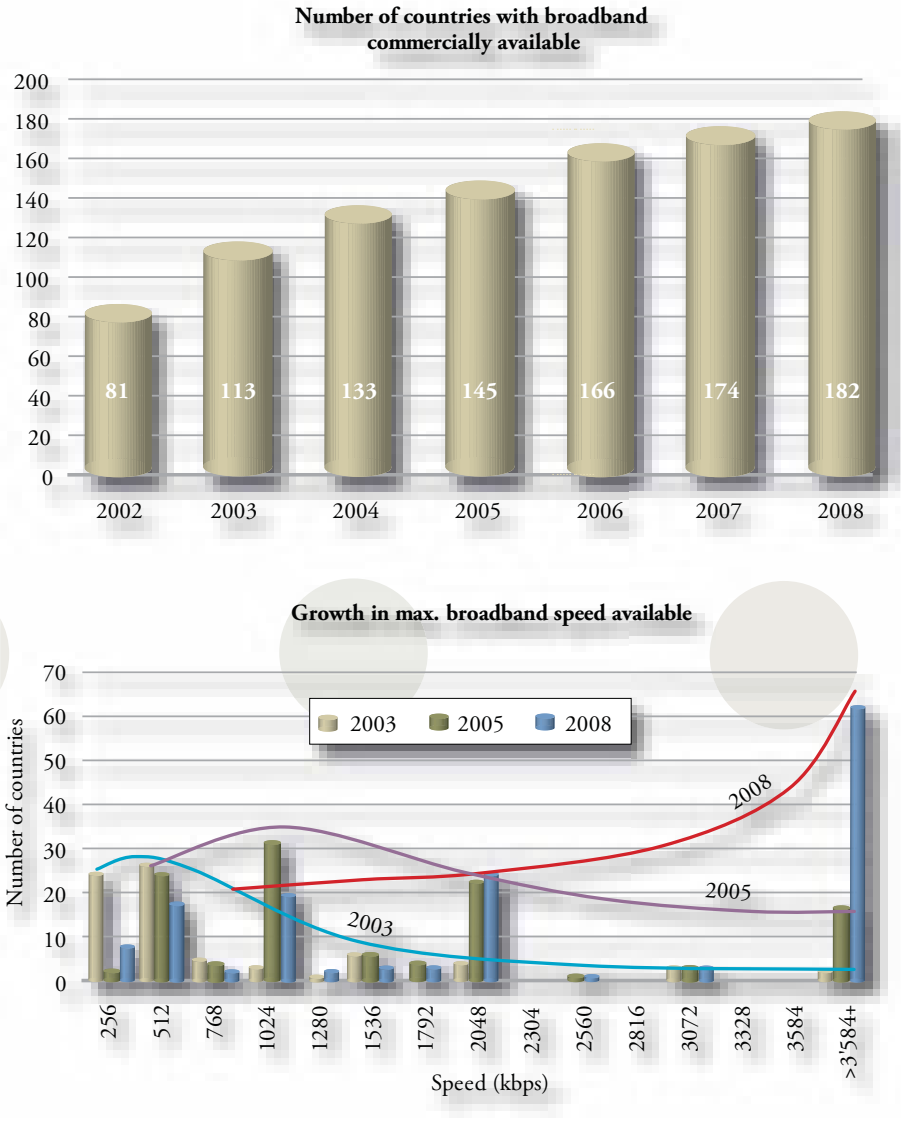
As a result, broadband access speeds have also increased. In 2003, only a handful of countries had commercial broadband offers of over 3.5 Mbps. In 2008, broadband Internet access speeds of 3.5 Mbps or more were commercially available in over sixty countries, inverting the distribution curve of broadband speeds for the first time (**Figure 8, bottom histogram chart**). However, if OECD countries in Europe, North America and Asia forge ahead with the deployment of FTTx networks, developing countries may once again find themselves on the wrong side of a growing digital divide. Widespread adoption of broadband stimulus plans could reshape the digital divide.

This Report has so far examined the consequences of stimulus plans for the financing and roll-out of ICT infrastructure. The next Section examines the impact of the financial crisis on the ICT industry and markets for different technologies, including wireless communication technologies, Next-Generation Networks and the satellite industry.



Evolution in Fixed Internet Access speeds

Figure 8



Source: ITU.

Note: commercial broadband is defined as Internet access at speeds of 256 kbps or more. These speeds are maximum commercial speeds advertised and are not always available (or achievable) due to traffic, utilization etc.

4.

Impact o

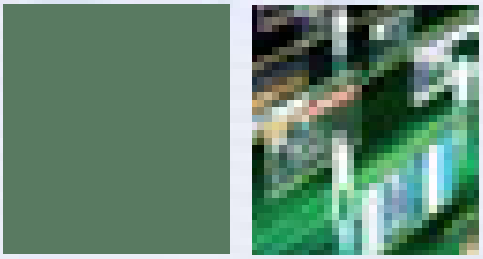
of the Financial Crisis

4.1 The ICT Industry

The ICT sector is now a sizeable and growing sector in many countries, typically accounting for up to 7.5% of GDP worldwide (depending on its definition) and an even higher proportion of GDP growth. Historically, the ICT industry has been viewed as a volatile, but resilient long-term growth industry riding a wave of innovation, even during difficult economic times. Today, there is clear evidence that the ICT industry is sharing the pain of the global recession with widespread lay-offs and restructuring – however, the financial crisis has had a markedly different impact on the individual technologies and it is difficult to speak of the overall general experience of the industry without allowing for the widely different experience of different sectors.

Telecom services are now vital services for consumers and businesses alike. Booz & Company (2009) note that "although the telecom industry has been more resilient than many industries during the economic downturn, it has faced the same challenges in accessing capital". There is some evidence to suggest that while the ICT industry has been far from immune to the economic slowdown, it has been less exposed than other sectors. For example, Pyramid Research projects that the telecom services market will still grow in 2009 and generate US$ 1.4 trillion in 2009. Pyramid Research considers that voice services will be hardest hit in 2009, contracting by 3% in 2009 (compared with a 6% expansion in 2008). However, "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.[64]

The financial crisis has also provoked some consolidation among some technology companies, with a few high-profile bankruptcies, mergers and acquisitions (e.g. Nortel). Despite this, some analysts see evidence for 'green shoots' of recovery in the ICT industry (**Insight 10**). The experience of previous crises suggests that economic crises can create openings for disruptive technologies and new start-ups.[65] The financial crisis may also accelerate the emergence of new, converged services and growth in many markets.

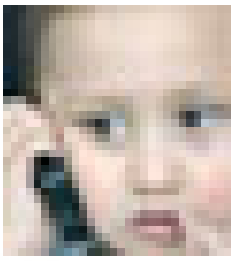


Insight 10: Green Shoots of Recovery in the ICT Industry?

The ICT industry had a tough start to 2009, with almost all Q1 2009 indicators in decline, often very sharply. In some sectors, year-on-year performance testied lows last reached in 2001-2002. However the ICT industry is performing better throughout this crisis than some other industries (for example, than the automobile industry) and there are tentative signs of recovery, with the rate of decline bottoming out and turning up, positive month-on-month growth for most countries and inventories running down sharply. The semiconductor industry is a bell-weather for developments in the ICT industry. Semiconductor production fell rapidly at end 2008 and in Q1 2009, with capacity use dropping towards 50% and semiconductor equipment manufacturers seeing very rapid falls in orders. However, there are been a recent sharp upturn in month-on-month semiconductor billings.

Hardware has declined much more than services. From analysis of global ICT firms, hardware sectors have been more negatively affected by the economic crisis than IT, software and Internet-related services. Semiconductor, electronics, communications and IT equipment have been particularly affected by slowing business and consumer demand. The communications equipment sector is feeling the pressure of the downturn, despite continuing investments in broadband.

ICT employment has trended downwards, but not as rapidly as for example in automobiles. There have been announcements of major lay-offs in the semiconductor and electronics sectors, with fewer job losses in IT services, software, and Internet-related activities. However, employment data for the ICT sector are still patchy and the net effects of these



announcements must be treated with caution, as they do not take into account new and continuing recruitment by firms.

R&D is declining, but it is performing somewhat better than employment and certainly better than production and, where it is declining, it is with a lag compared with turnover and employment. Investments in R&D and innovation are clearly seen as ways to increase future competitiveness and develop new growth areas. On the small new firm side, venture capital has slowed very markedly from mid-2008, but around one-half continues to flow into the sector and into ICT-intensive clean technologies.

There are also clear regional differences in the impact of the crisis. Asian OECD countries were especially hard-hit by the downturn, with slumping production and soaring inventories, particularly in Japan. Other Asian economies have also been severely affected – for example, China, Hong Kong (China) and Singapore. Asian ICT trade has been down by 25-40% year-on-year, as the crisis took its toll on integrated Asian production and trade networks. The Americas, Europe and Asia have all been negatively affected by the current crisis. Asia's performance was worse than was expected at the outset of the global recession due to currency fluctuations and plunging exports and slowing domestic demand for Chinese producers and their suppliers. However, the recent month-on-month upturn has been very rapid, particularly in Japan and the Republic of Korea, and China has returned to positive growth after slipping below zero year-on-year growth at the start of 2009.

Source: OECD (2009), "The Impact of the Crisis on ICTs and their Role in the Recovery", available from http://www.oecd.org.

4.2 Wireless Communication Technologies

Overall, mobile telephony remains a high-growth ICT sector, with healthy returns on investment, steady growth metrics and short planning horizons to recoup investments. Worldwide, the total number of mobile subscribers continues to grow despite the financial crisis. The research consultancy the Mobile World estimates that some 140 million new subscribers were added globally in Q1 2009, bringing the global total to some 4.15 billion mobile subscriptions in March 2009 (**Insight 11**). Of these 140 million new subscribers, some 98 million came from Asia (with 45 million new subscribers in India alone). By comparison, growth in Europe was negligible, at not much over 1 million in the first quarter, while Eastern Europe showed some severe reductions in subscriber base in Q1 2009.

In terms of handset shipments, ABI Research notes that the first quarter always delivers a sequential drop in handset shipments after the holiday season, but its analysis suggests that the drop in mobile handsets in Q1 2009 was especially sharp, with the global mobile market shipping 255.6 million handsets in Q1 2009, 35 million fewer units or a 12% decline over Q1 2008 (and a 20% decline from Q4 2008), with this trend likely to continue throughout 2009.[66] Some niche markets have been relatively unaffected – Gartner Research estimates that in Q1 2009, while worldwide mobile phone sales reported an 8.6% decline year-on-year from Q1 2008, smartphone sales surpassed 36.4 million units, a 12.7% increase on the same period last year.[67]

Growth in developing markets is expected to slow, but not decline. ABI Research estimates that Asia-Pacific posted only an 8% year-on-year decline in handset shipments, while the Latin American market experienced a 28% decline, the largest decline of any region largely due to currency devaluations driving up the prices of imported mobile phones. Growth in the largest developing markets is expected to continue with hardly any observable effect from the crisis. Pyramid Research forecasts an ongoing Compound Annual Growth Rate (CAGR) of 7.4% for China's mobile subscribers that will drive the Chinese mobile market past the 1 billion mobile subscriber milestone in 2012 to reach 1.1 billion in 2014, when mobile penetration will be equivalent to 80%, compared with 52% at the end of 2008.[68] Merrill Lynch recently predicted that mobile subscription growth

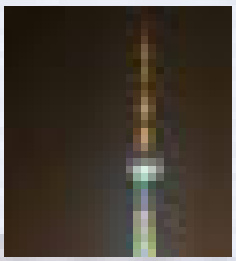
in Latin America would remain steady, but mobile Average Revenue Per User (ARPUs) could fall marginally in 2009. However, Merrill Lynch does not see Latin American mobile operators cutting operational expenditures or capex due to funding needs.[69]

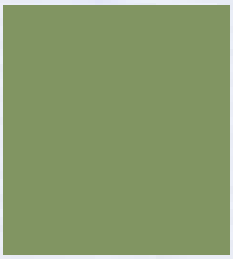
Indeed, distinctions between mature markets and high-growth emerging markets are now less relevant, as these markets converge in terms of connectivity speeds available, contractual base, customer churn and even margins. However, in the developed countries where the effects of the economic downturn were felt first, usage may be suffering due to growing unemployment. Further price falls seem likely, driven by weakening consumer demand. Indeed, in Q1 2009, the UK mobile market saw its first quarterly net loss of customers for three years,[70] while Vodafone Turkey also saw a reduction in its subscriber base.[71]

ABI Research suggests that by mid-2009, "the mobile services industry has up to this point been recession-proof". However, the longer that economic recovery is delayed and unemployment rates remain high, the more the mobile services market will be impacted.[72] According to a study by ABI Research, even under the worst recovery scenarios, mobile services revenues will continue to grow at nearly 1.2% annually until 2014, just 0.5% down on pre-crisis conditions.[73] Global Insight suggests that mobile operators are increasingly focusing on raising ARPU and service revenues in existing markets, as the economic climate becomes more challenging.[74]

Mobile broadband will remain a major development, with operators prioritizing mobile broadband as critical to their future success. iDATE estimates that 3G compatible handsets accounted for some 20% of the handset market in 2008, while 3.5G accounted for under 5%. Depending on the market, iDATE estimates that voice and text messaging services account for between 70-90% of operators' incomes in mature markets, with "the main threat to their financial well-being in the short term is seeing this revenue decline".[75] The GSM Association estimates that globally, HSPA connections will surpass 150 million by August 2009, with more than 300 networks across 127 countries and nearly 1500 HSPA-enabled devices available.[76]

Growth in mobile broadband is happening and here to stay, despite the financial crisis. Mobile broadband Internet will be accompanied by an explosion in new services and applications, but there is divergence in





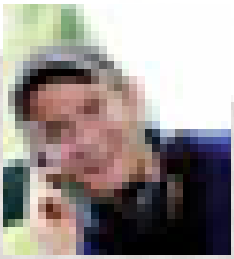
Insight 11: Outlook from The Mobile World

The picture emerging from the June 2009 quarterly earnings is more positive than could have been hoped six months ago. Growth in mobile subscriptions has continued over the nine months since September 2008, albeit at reduced rates. However, some markets have been far more badly affected than others, while mobile usage has slowed in almost all territories, with an adverse impact on revenues and profitability.

The Mobile World Database indicates a March 2009 total of 4.15bn connections worldwide, up from 3.84bn at the end of September 2008, equivalent to an annualized growth rate of just under 11%. We expect a global total for mobile subscriptions of between 4.25-4.26 billion by June 2009, with most new growth coming from Asia and, to a lesser extent, Africa. We do not expect to see much in the way of growth from the developed world and it is even possible that Europe – with its 119% penetration rate by March 2009 - might even see net disconnections.

Reductions in usage are probably causing operators more concern, however. Lower usage means lower revenues, without corresponding reductions in the - relatively fixed - costs associated with that traffic. For example, in the case of the Brazilian operator TIM Participacoes, average minutes of use dropped from 101 per month to 86 in Q4 2008 and to just 70 minutes per month in Q1 2009. With no increase in the overall subscriber base, network loading has fallen by more than 27% or about 2.5 billion minutes per quarter. One result is a reduction in interconnection payments, but this can never compensate for the loss of revenues, and TIM has experienced a large swing into loss over the last six months.

In this context, it is interesting to note that the major US operators have seen little impact on ARPUs or usage, despite the rising unemployment. What's going on here? The vast majority of US subscribers are connected through long-term contracts, which softens the impact on monthly subscriber numbers. Last year's redundancies may still, officially, be hooked up to AT&T or Verizon. And there is little impact so far on ARPUs or MoUs just yet either, as most corporate customers are on "big bundle" packages where usage is estimated at 700 or 1,000 minutes a month, even when former employees are no longer working. The only detectable effect of recession – so far – is on profit & loss accounts, where reduced intercon-



nection payments are increasing overall levels of profitability. However, this will not last and low-tariff operators are seeing record new connections as newly unemployed people rush to reconnect.

Lower usage levels and highly competitive markets mean that average revenue per customer is continuing to fall in many markets, with reductions of 10% or more between Q4 2008 and Q1 2009 common. Merger and acquisition (M&A) activity is also back in fashion, with well-financed operators taking advantage of depressed valuations to strengthen their strategic positioning, especially in the emerging markets of Asia and Africa. Most notably, last year's proposed Bharti-MTN deal might be back on the cards, which, if concluded, would be among the five largest operators in the world in terms of customer numbers. The Vodafone Group has also been busy - over the past nine months, it has bought Ghana Telecom and acquired another 15% stake in South Africa's Vodacom, to give it control of the business and its four international subsidiaries. Qtel, from Qatar, is also committed to an expansion strategy and has recently taken control of Indosat in Indonesia.

These markets offer high growth, but also opportunities to develop new services and revenue streams that could be subsequently repatriated to advantage. The cash transfer systems that have been developed in Africa and elsewhere are one case in point. Vodafone's M-PESA system has over 6 million users in Kenya alone (half of all the company's customers) and is being used to transfer sums equivalent to half the national GDP per capita every year. This makes European e-banking look puny by comparison.

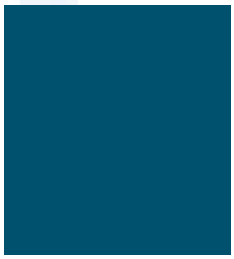
While developing world deals are essentially expansive in nature, consolidation is on the rise in more mature markets. With few new subscribers to attract, network operators are looking to reduce costs. When Orange sold out of the Netherlands, few thought the deal particularly significant, but profitability has improved at all three of the remaining operators. A sale by T-Mobile of its UK arm might achieve a similar result, assuming it would be permitted. More fundamentally, Vodafone's network-sharing deals in Australia (with Hutchison) and Europe (with Telefonica) are designed to cut capital expenditure budgets and avoid unnecessary investments in duplicate networks. Might they ultimately signal a return to the concept of "natural monopolies"?

Source: John Tysoe, General Manager, the Mobile World research consultancy.

opinion as to whether this will happen predominantly through laptop computers or enhanced handsets.[77] The GSM Association believes there is potential to connect 2.4 billion people to the Internet by 2013 over mobile devices, compared to the 200-300 million people currently connected to the Internet over mobile networks in April 2009.[78] A.T. Kearney projects that the mobile industry is forecast to invest

> A long economic recovery puts pressure on mobile operators to compete on price. Mobile data services allow operators to counter that pressure. Mobile operators need to pursue appropriate service personalization initiatives that allow customers to buy and use services in ways that best suit their needs. Business customers also should be a target segment as businesses consider mobile a way to lower costs and increase competitiveness.

ABI Research Practice Director Dan Shey, quoted at "Study: Mobile Services Market Will Grow Despite Economy", at: http://www.industryweek.com/articles/study_mobile_services_market_will_grow_despite_economy_19435.aspx



US$ 800 billion over the next five years, of which US$ 550 billion is earmarked for mobile broadband. However, a more "stable, predictable and minimally intrusive" regulatory environment and greater radio spectrum were sought as preconditions for further investment by the mobile industry. [79]

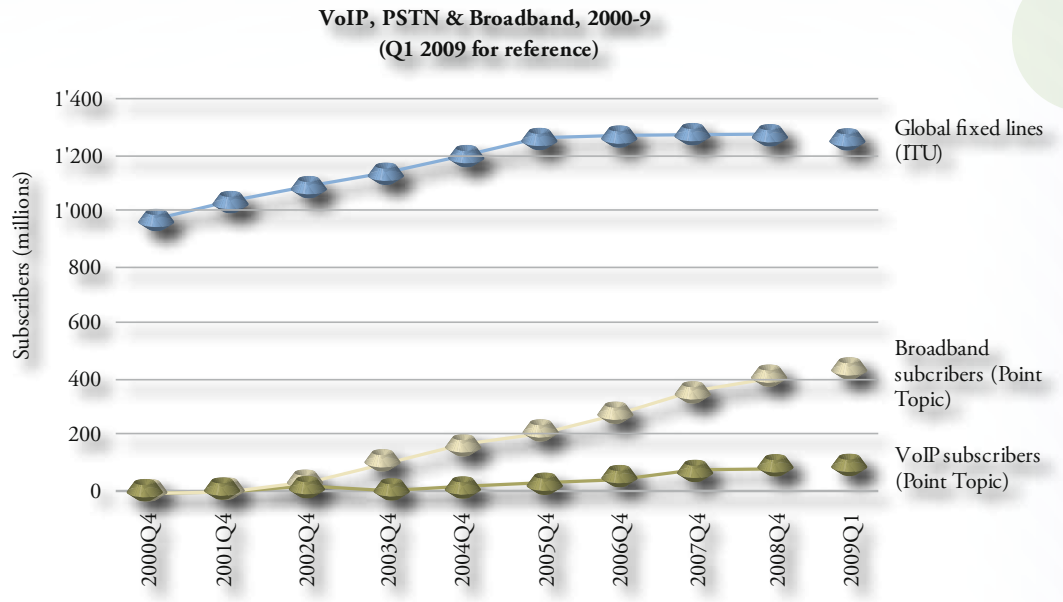
Emerging markets will also be a major marketplace for this mobile Internet growth to occur. The research consultancy MobileSquared projects there will be over 300 million browser-enabled mobile devices in India by 2013, and of these handsets it is estimated that up to 70% will be 3G devices.[80] Pyramid Research forecasts that mobile broadband will surpass fixed broadband in Brazil by 2011, reaching nearly 27 million data card users in 2014, up from 1.5 million in 2008.[81] The large mobile subscriber bases in developing countries could adapt quickly to mobile Internet access, although they remain relatively price-sensitive. Growing economies of scale could cut the cost of mobile broadband access and make it a mass market, especially in developing countries with limited fixed access networks.

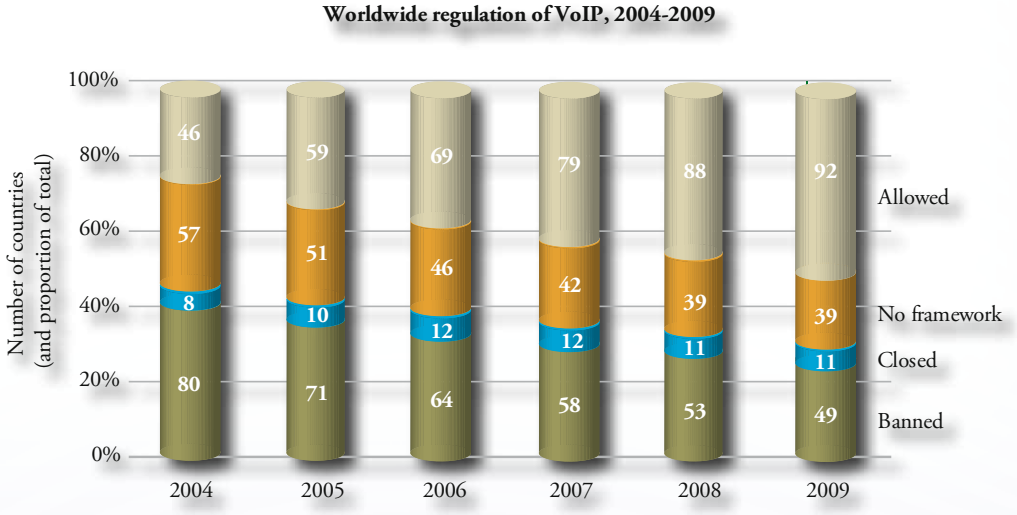
The next evolution of the technology track initiated by GSM and further developed by WCDMA and HSPA (including HSPA+ and HSPA-evo) is Long Term Evolution or LTE. After being standardized globally initial deployments are now in progress in Asia, Europe and North America with the first commercial services expected in late 2009 and early 2010 in the US, Japan, Sweden, Norway. Many mobile operators see LTE as a key upgrade for high-speed and high-capacity mobile broadband services, creating additional momentum in product development and attracting a large number of competing vendors to the market.

LTE can deliver higher broadband connection speeds and faster network response ("lower latency") at a lower cost per delivered bit, thanks to a simplified network structure and the use of wider spectrum bands than previous technologies. The availability of harmonized spectrum and wider spectrum bands per operator from agreements at ITU World Radiocommunication Conferences enables economies of scale for all wireless technologies and the delivery of multi-megabit broadband also to rural areas that are expensive to serve by fixed networks.

While the financial crisis has delayed some network investments, it has also sharpened the requirement

Figure 9 VoIP, PSTN and Broadband, 2000-9





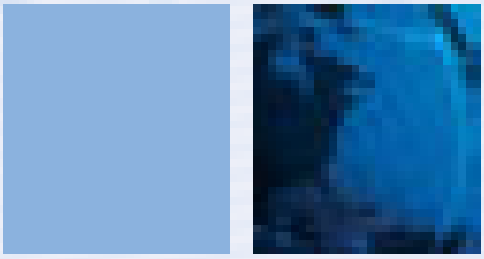
Source: Point Topic (top chart), ITU (bottom chart).

among operators to focus on global standards and reach mass markets. LTE is scheduled to see its first commercial deployments in 2009/2010, with wider deployments taking place in 2011-12. For example, the Vodafone Group has confirmed that it will be launching LTE in Europe in 2012. Booz & Company (2009) note that operators intending to deploy LTE over the next 2-3 years need to have a high-speed fixed network in place to support mobile broadband service and that LTE deployments will still need mobile stations at closely-spaced intervals connected by fibre.

4.3 Fixed Broadband Internet and NGN

Since few of the stimulus plans have been initiated yet, gains in broadband Internet subscribers fuelled by stimulus funding have not yet been realized. ITU estimates that there were nearly 405.9 million broadband subscribers at the end of 2008, up 16% from 349.7 million broadband subscribers at the end of 2007. Although 2008 was a tough operating year for broadband (**Insight 12**), growth in broadband subscribers over 2008 was in line with long-term trends (**Figure 9, top chart**). A

VoIP

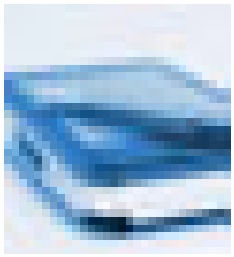


new Parks Associates' study found that household broadband service jumped 18% worldwide in 2008 alone and projects that more than 640 million households worldwide will have broadband by 2013. New applications, greater public awareness and discussions of the stimulus plan may have even boosted broadband take-up in some countries, despite the recession. There was strong growth in broadband subscribers in the USA with China, Brazil and, to a lesser extent, Canada also looking strong (**Insight 12**).

In the United States, the Pew Internet & American Life Project report on broadband penetration released in June showed that the percentage of US homes with access to high-speed internet access continued to rise, despite the current recession.[82] The survey, conducted by Pew in April, found that 63% of adult Americans now have broadband Internet connections at home, compared with 55% of adult Americans in 2008. These results led Pew to conclude that "broadband adoption appears to have been largely immune to the effects of the current economic recession", which commentators have attributed to greater public awareness of the benefits of broadband following news coverage of the stimulus plan to people's desire to curtail entertainment outside the home and improve their home entertainment options.

One broadband service that is enjoying greater take-up despite the recession is Voice over Internet Protocol (VoIP), the first stage of an IP-enabled next-generation network for many countries. Although VoIP estimates are increasingly difficult to make, owing to the difficulties of estimating PC-to-PC users, VoIP traffic and VoIP subscribers have increased steadily by all metrics. TeleGeography Inc. (2008) estimates that VoIP accounted for an estimated 25% of international voice traffic in 2008, with Skype alone accounting for 8%. There were between 69-80 million VoIP subscribers in 2008. [83]

According to ITU's most recent regulatory survey tracking the regulatory treatment of VoIP for 191 countries since 2004, by mid-2009, over two-thirds of countries now allow VoIP, with 92 countries that have explicitly legalized VoIP, while another 39 tolerate VoIP (**Figure 9, bottom chart**). Point Topic estimates that contractual VoIP subscribers now account for some 7% of fixed lines at the end of Q1 2009 and some 21% of broadband subscribers (**Figure 9, top chart**). In recessionary times, when



Insight 12: Broadband subscriber additions in Q1 2009 – China and the US lead the way

2008 was a tough operating year for broadband. The six months at the start of the year in particular saw low growth and low net additions almost across the board. The first quarter is traditionally a tougher quarter than Q4, so it is not surprising to see low percentage growth rates, however all these regions could still have tough times ahead.

While broadband subscriber additions looked shaky at the start of 2009 for Europe and Japan, the real stand-outs in Q1 2009 are the USA with China, Brazil and, to a lesser extent, Canada also looking strong. Brazil, Russia, India and China (the BRIC countries) saw much slower growth later in 2008 than earlier.

Both the US and Canada show signs of emerging from a period of slow broadband growth. The US has posted two consecutive quarters of strong net additions, with increases in real numbers not seen since early 2007. Recent surveys indicate US consumers place a high value on broadband, and are willing to cut back in other areas to make sure they can get a fast online service and this is confirmed by the numbers. The announcement of the broadband stimulus package is also likely to make a significant difference to take-up and penetration, once its effects filter through.

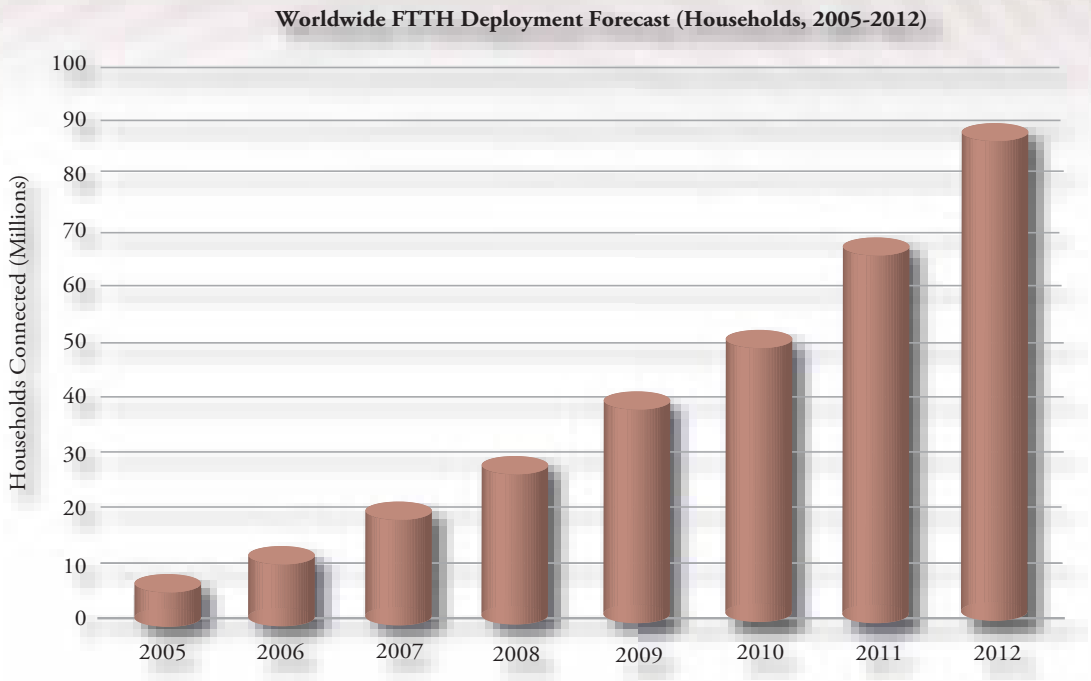
Broadband subscriber additions in Latin America and South and East Asia are also looking healthy. Both regions are dominated by two big players, Brazil and Mexico, and China and India, respectively. When these countries do well, their regions do well. All four countries suffered a slowdown in late 2008, but only in relative terms, and all seem to have returned close to or above their previous performance levels. Eastern Europe, Middle East & Africa and Asia-Pacific all show mixed trends. All these regions had countries that fared reasonably well and others that have suffered.

Digital Subscriber Links (DSL) continue to lose market share to other broadband technologies. It is a slow decline but the evidence is that a gradual substitution is taking place where higher speed technologies are available. Fibre is the only access technology growing from quarter to quarter. Generally, where the three dominant technologies are available, consumers tend to drift towards fibre. Aggressive pricing strategies have contributed to this growth.

Cable presents a mixed picture in terms of subscriber numbers. Although the overall trend has been a very slow decline in market share, there is evidence that operators are responding with implementation of upgrades such as DOCSIS3.0 which significantly increases the bandwidth available, as well as strategic pricing decisions designed to balance the revenue and market share drift. Other broadband access technologies, such as fixed wireless, satellite, powerline and so on are also slowly gaining market share. This is primarily due to their growing success at plugging not-spots, where fixed broadband lines are uneconomic to deploy.

Source: Point Topic, available at: http://point-topic.com/content/dslanalysis/BBAq109bbsubs.htm

Figure 10 Worldwide FTTH Deployment Forecasts



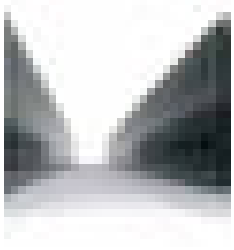
Source: Heavy Reading

consumers are keen to cut costs, growth in VoIP services may be spurred by consumers searching for cheaper call rates. Indeed, the incumbent operator in New Caledonia saw a 20% migration in external traffic towards its VoIP service in October 2008, based on consumer perceptions of its VoIP services being cheaper. [84]

In terms of NGN deployment, many NGN deployments are going ahead despite the financial crisis, with or without state support. Heavy Reading estimates that 9 million households will gain access to fibre over 2009, to reach a total of 39 million households worldwide and projects that FTTH installations will increase by 30% annually over the next five years (**Figure 10**). A record 130 million households are likely to have fiber connectivity by 2013, up from 36 million households with access to fiber last year, with Asia accounting for the lion's share with almost 85 million Asian households connected through fiber by 2013. Some 23 million connections are expected in the Americas (with most in the US), while 24 million households will have fiber throughout Europe, the Middle East and Africa.[85] Heavy Reading predicts that FTTH will eventually reach 80% or more of households in developed nations over the next 15-20 years, again raising implications for the future of the digital divide, since developing countries are highly unlikely to be able to keep pace with this rate of deployment.

> By using a part of the EU's financial package to help people to invest in their ground equipment, we could connect a million extra businesses or households in rural areas by the end of 2010.

Giuliano Berretta, Chairman, European Satellite Operators Association.



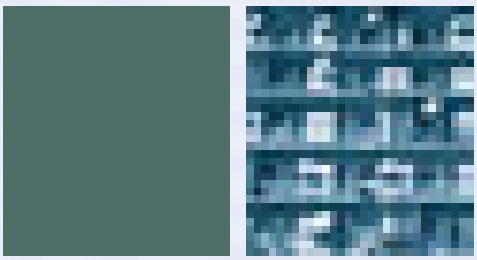
4.4 Satellite Technologies

Satellite technologies can play a vital role in the provision of a host of communication services. Satellites can provide vital 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.[86] Despite the capital-intensive nature of the industry, growth and demand projections for the satellite industry have barely been dented during the economic downturn. This is partly due to the long lead times involved in planning and launching a satellite (with current launch activity reflecting projects planned 2-3 years ago). However, the satellite industry can also provide broadband Internet connectivity at virtually zero additional marginal cost once the satellite is deployed (**Insight 13**), which can make satellite operators good candidates for stimulus funding in some countries.

Proponents of the satellite industry contend that satellite providers are well-equipped to deliver broadband to underserved areas quickly (**Insight 13**). Stimulus funds could be used to subsidize installation costs or reduce monthly fees (and making them comparable to DSL or cable, depending on the market). Stimulus funds could also be used to increase bandwidth. In all these cases, the satellite industry can boost broadband penetration, provide better service to underserved areas rapidly and generate significant employment in various associated industries (e.g. installers, operating technicians, sales force etc.), another major goal of economic stimulus plans.

However, some commentators have expressed concern that making stimulus funds conditional on network neutrality or network management regulations may raise issues of service quality degradation for satellite broadband services (as these are dependent on TCP acceleration to compensate for the negative effects that the satellite delay).[87] They suggest that this could pose problems for some satellite providers and make them reluctant to accept stimulus funds.

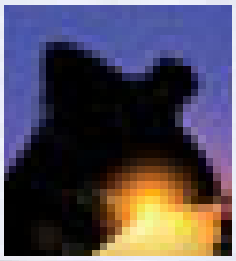
Euroconsult notes that "the ongoing global economic crisis will have only a limited impact on the industry. Governments around the world remain committed to space technology development and only a small number of commercial satellite operators with business or financing issues will be affected by the



downturn". Industry analysts remain virtually united in maintaining their growth forecasts, and continue to forecast a consistent 7-8% annual growth despite the economic downturn and before any stimulus funds are taken into account (**Insight 13**). Euroconsult forecasts that the commercial satellite market will grow by over one third with 235 satellites to be launched over 2009-2018 with a market value of US$ 52 billion (**Insight 14**).

Even before stimulus funding has been disbursed, 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. 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.

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 (**Insights 13 and 14**).



Insight 13: How The Satellite Industry is Unique

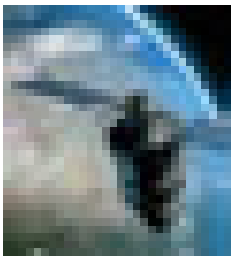
Satellite communications and broadcasting systems are extraordinary communication networks unlike any other for two main reasons:

- Satellite communications are deployed in one 'fell swoop', as soon as the satellite reaches orbit and is operational - anyone in the coverage area has the ability to access satellite services instantaneously simply by buying a terminal. This is a fundamental difference with terrestrial networks, which are generally deployed progressively due to the civil engineering works needed - first covering towns and cities, then urban peripheries; beyond these limits, returns on investment become more complex and less certain.

- Satellite systems are also relatively simple, insofar as they comprise only two 'links': the satellite (the property of the operator which maintains and runs it) and the terminal, which is installed directly by the subscriber, under their ownership and responsibility. This terminal can be financed either directly by the subscriber or through a subsidy, under a government policy to reduce the digital divide.

They therefore avoid all the problems of intermediary last-mile infrastructure which can give rise to a series of legal problems - under which circumstances can a public entities invest in distribution networks? Financial issues also abound - who should fund the investment, and who retains legal ownership? Who is entitled to the profits? As well as operational issues in terms of who should run the network, and who undertakes maintenance and pays insurance against damage or degradation.

All these issues simply do not arise in the case of satellite communications. The "network" consists only of the satellite - the property of the operator - and the terminal - the property of the subscribers. The implications of these two key points are essential. With satellite communications, coverage is quite literally 'continental'. All households and firms located within the footprint can be served in an equal way – each one can potentially access the same quality of service, at the same time, under similar terms and conditions of service – terminal equipment is the only requirement, which can be very rapidly and



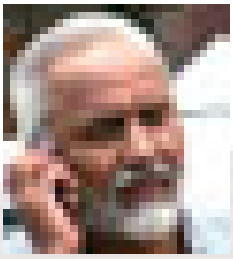
easily installed. Satellite communications are perhaps one of the most egalitarian broadcasting services ever known, including for developing countries or countries at a geographical disadvantage for the deployment of terrestrial networks.

The slowdown does not affect the satellite industry, as the rate of new connections depends solely on end-users, and not of the capacity of operators to finance new infrastructure. On the contrary, satellite is even in this time of crisis a privileged tool of public policy in order to ensure that everyone, no matter where they are situated, and whatever their needs, can access the Internet.

Eutelsat is the premier operator of satellites in Europe and the third-largest global player, with turnover amounting to nearly EUR 900 million. Its fleet currently comprises 27 operational satellites, spread over 20 orbital positions, covering the whole of Europe, central Asia, Africa, the Middle East and major parts of Asia and Latin America. Eutelsat broadcasts over 3,200 television channels to 190 million households, either through a direct reception system (parabola) or through a cable network supplied by Eutelsat satellites.

Eutelsat's satellites offer other telecommunication services for multinationals, professionals, but also increasing specific services such as satellite broadband Internet access. Many countries and regions (for example, the European Union) have established policies to bridge the digital divide, in which satellites play an indispensable role to connect the most remote zones and areas, which are unlikely to ever prove viable for terrestrial communication services.

Eutelsat's deployment plans for new satellites are growing at an unprecedented, with no fewer than eleven new satellites to be deployed in orbit between December 2008 and mid-2011. Each satellite requires an investment of EUR 250-300 million for construction, launch and associated operations. These eleven satellites therefore represent a total investment of nearly EUR 3 billion in thirty months, more than the total turnover of the company over

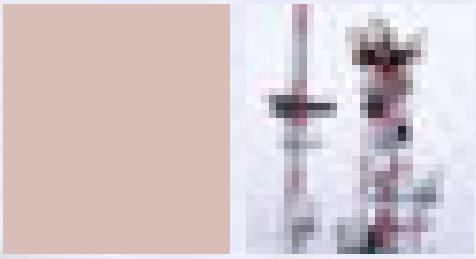


the same period. These investment plans have not slowed down in any way due to the financial crisis; to the contrary, Eutelsat's organic business continues to grow by nearly 6-7 % per year. This is proof of the sustained demand for satellite services in Europe, Africa, the Middle-East and Asia, from newly-created TV channels or very large audiences, as well as demand from thousands of new clients in rural areas for economical high-speed Internet access.

Like the majority of other satellite operators, the solidity of Eutelsat's balance sheet enables it to access « corporate », financing in its own name, and not only ad-hoc financing, on the basis of individual projects, where the terms and conditions of access to credit may suffer, in part due to growing uncertainty about future projections in business plans.

The satellite industry has been unaffected by the financial crisis, a sign of the quality of service that the satellite industry offers, as well as how much these services can enrich our daily lives.

Source: Yves Blanc, Director of Strategy and Institutional Relations, Eutelsat.



Insight 14: 50% Growth in the Global Satellite Market over the Next Decade

Euroconsult predicts that government and commercial markets will jump in the value and number of satellites. Euroconsult estimates that 1,185 satellites will be built and launched over 2009-2018, 50% up on the previous decade. Market revenues generated from the manufacture and launch of these satellites are forecast to grow by a similar rate, reaching US$ 178 billion over 2009-2018. Both government and commercial sectors will contribute to this market growth, albeit unequally.

Governments drive future satellite demand, particularly for civilian applications. Civilian and military government agencies will launch a combined 770 satellites in the next decade, a 55% unit increase over the past decade. Two-thirds of these satellites will be for civilian or dual use. Civil satellites represent a higher proportion of government satellites than the previous decade. While ongoing defense and security concerns create opportunities for dedicated satellites or hosted payloads on commercial satellites, demand for proprietary military satellite systems remains concentrated in a limited number of countries.

Market growth will come from satellites for operational missions in Earth observation, meteorology, navigation, and communications, space science & exploration missions, and technology demonstration. Earth observation is emerging as the largest application, with a total of 230 satellites planned over the next decade as more governments order and launch satellites through national space agencies, multilateral agencies and public-private partnerships for both civilian and military uses of satellite imagery.

At US$ 116 billion over the decade, the government market is almost double the commercial market, but it is largely closed to non-domestic suppliers. Most of that market is for satellites whose final destinations are low-Earth orbits (41%) with higher altitude orbits (GTO, MEO, HEO and deep space) making up the difference.

Source: "Satellites to be Built & Launched by 2018, World Market Survey", 8 June 2009, available at: http://www.euroconsult-ec.com/news/press-release-33-1.html.

5. Conclusio

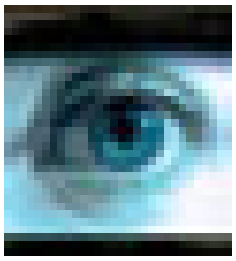
ns: Investing In The Future

The current crisis has revived major debates in economics about the role of government in infrastructure investment, the meaning of Keynesian demand management in a globalized era, and whether government investment 'crowds out' private sector investment. This Report has explored the relevance of these debates to the ICT industry, as it makes the transition to IP-based networks. The financial crisis has cut squarely across operators' plans to upgrade their networks and roll out NGNs. Operators face greater challenges in accessing capital, more expensive financing and great uncertainty about future regulation and the revenue streams associated with NGNs. In the difficult economic climate, there have been calls for greater government involvement in the provision of telecommunications, reversing the trend towards greater private sector participation over the last three decades.

This Report has examined the role that investments in ICT infrastructure as part of economic stimulus plans can play in regenerating economic growth and promoting economic recovery. Investments in ICTs can play a strong role in generating economic recovery given their strong externalities, high multiplier effects in returns on investment and reduced leakages. Social returns to investment in ICT infrastructure are likely to exceed the individual private returns on investment, suggesting that the private sector alone is unlikely to generate the socially optimal levels of investment.

Although large-scale public infrastructure investments take longer to implement, infrastructure investments are also likely to generate more robust and durable economic growth than other types of stimulus measures. Effective stimulus measures should be timely, targeted and temporary. On this basis, many OECD countries have included broadband and ICT investments in their stimulus plans and are exploring new state financing packages for national broadband infrastructure. There are new opportunities for government to get involved in the financing and regulation of national ICT infrastructure.

In reality, the current emphasis on financing in stimulus packages may overlook more simple and immediate measures that governments can take to promote private sector investment – for example, in reforming tax structures, creating greater regulatory

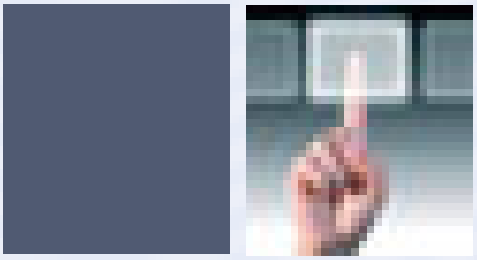


clarity and resolving spectrum issues. All of these factors can help promote an enabling framework and generate growth within the ICT sector and beyond, as repeatedly found by econometric studies of the relationship between ICTs and economic growth.

There are also likely to be competitive consequences to economic stimulus plans in terms of tilting the playing field and potentially favoring incumbents with extensive established backbone networks. Stimulus plans must be designed carefully in such a way as to minimize these dangers. Furthermore, broadband stimulus plans create risks that governments engage in 'picking technologies', 'picking winners' and 'picking communities'. It is important to address these issues upfront to ensure that stimulus funds are well-spent, to the benefit of the industry.

Broadband stimulus plans are also likely to have significant consequences for the digital divide. If they fail to prioritize ICT infrastructure, developing countries may neglect a great development opportunity of the economic benefits broadband infrastructure can bring. Further, if industrialized countries forge ahead with state-subsidized investments in high-bandwidth networks, developing countries may find themselves on the wrong side of a growing digital divide.

In conclusion, there is a strong role for ICT investments to play in promoting economic recovery. The ICT industry is an industry based on technological transformation and stimulus plans can help promote the roll-out of NGN and advanced infrastructure to the benefit of consumers, businesses and government alike. The crisis is challenging many firms, but given the strategic importance of the ICT industry in underpinning the communication capabilities and informational and data processing needs of other industries, the need to extend the benefits of connectivity to all the world's inhabitants remains paramount.



LIST OF ACRONYMS AND ABBREVIATIONS

ARPU	Average Revenue Per User
BT	UK British Telecom
BWA	Broadband Wireless Access
CAGR	Compound Annual Growth Rate
CBO	US Congressional Budget Office
CFIC	New Zealand Crown Fibre Investment Co
DSL	Digital Subscriber Line
DSLAM	Digital Subscriber Line Access Multiplexer
EPI	US Economic Policy Institute
EU	European Union
EUR	Euro
FSS	Fixed-Satellite Service
FTTC	Fibre to the Cabinet
FTTH	Fibre-to-the Home
FTTx	Fibre to the X
GDP	Gross Domestic Product
HSPA	High-Speed Packet Access
HTS	High Throughput Satellite
IAB	US Interactive Advertising Bureau
ICT	Information and Communication Technology
ILO	International Labour Office
IMF	International Monetary Fund
IP	Internet Protocol
IPTV	Internet Protocol Television
ITU	International Telecommunication Union

Kbps	Kilobit per second
LTE	Long Term Evolution
Mbps	Megabit per second
NCTA	National Cable & Telecommunications Association (NCTA)
NGN	Next-Generation Network
NTIA	US National Telecommunications and Information Administration
OECD	Organisation for Economic Cooperation and Development
R&D	Research & Development
RUS	US Rural Utilities Service
SNG	Strategic Networks Group
UK	United Kingdom
US	United States
US$	United States Dollar
VAT	Value-Added Tax
VoIP	Voice over Internet Protocol
W-CDMA	Wideband Code Division Multiple Access

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END-NOTES

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