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Superfast Broadband

The future is in your hands



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The McKell Institute takes its name from New South Wales' wartime Premier and Governor-General of Australia, William McKell.

William McKell made a powerful contribution to both New South Wales and Australian society through progressive social, economic and environmental reforms.

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The McKell Institute has produced this report with the support of Vodafone Australia.

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OCTOBER 2013

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Michael was the chair of the ABA's Planning and Licensing Committee that was responsible for developing spectrum plans for digital television, and allocating the last available FM radio frequencies.

Michael is Chief Executive of the Australian Publishers Association, a Director of the Technology Dispute Centre Pty Ltd, President of the Australian Chapter of the International Institute of Communications and a Fellow of the McKell Institute.







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Foreword

Public policy in the area of Information and Communications

Technology (ICT) is regularly reassessed based on the constantly advancing technological landscape and the insatiable demands of business and consumers.

This process requires consideration of current demands as well as informed projections of future demand.

When the Rudd Government was elected in 2007 with a commitment to build a National Broadband Network ('NBN'), 'smartphones' were essentially limited to the Blackberry, which were renowned for their ability to send and receive emails via mobile networks. Less than one year later the iPhone was released in Australia, heralding a step change in the way Australians use and access mobile networks.

Today, more Australians access the internet via mobile devices, such as smartphones or tablets, than through computers and other traditional fixed devices. This has resulted in an explosion of data use through Australian mobile and Wi-Fi networks.

Mobile devices that did not exist five years ago are now essential tools for both consumers and business, with products and applications in fields as diverse as healthcare, aged care, education and even domestic violence prevention. Almost half of Australian businesses expect to transact with their customers using a mobile application in the next 3-5 years.

This explosion in mobile data usage has the potential to not only improve productivity, access to services, and quality of life, but also economic growth, with studies estimating that a doubling of mobile data usage increases GDP per capita by 0.5 per cent. All of these developments make 'traditional' email and internet access seem antiquated in comparison.

Faced with such rapid change, it is vital that Australia's digital infrastructure meets current consumer demand while providing opportunities for future expansion.

This paper makes the case that the NBN, far from becoming redundant due to the explosion in mobile internet access, is in fact crucial to delivering better mobile services to both regional and urban areas without any significant increases in cost.

It argues that the recent development of small mobile base stations (able to be placed on lampposts for example), connected to the NBN, can significantly increase and improve mobile coverage in both urban and regional Australia. This has the potential to radically reshape Australia's economic and social future for the better.

We thank Vodafone Australia for their support in making this worthy contribution to public discussion possible and commend this paper to you.



The Hon John Watkins
CHAIR,
MCKELL INSTITUTE

Peter Bentley
EXECUTIVE DIRECTOR,
MCKELL INSTITUTE



Introduction

Fifteen years ago, mobiles were a niche product focused primarily on delivering a voice service; the first great mobile ‘application’ – the SMS – was in its infancy, and data services were barely contemplated.

In just a few years there has been profound change. Most consumers now consider mobiles to be their preferred form of communication; smartphones and tablets are now the main way consumers access the internet; and smartphone apps are pervasive and impact every aspect of our work and lives.

The mobile revolution is well underway ... and the best is yet to come.

As society moves forward in this great technological journey it is vital that we do two things. First, we need to recognise the importance of upgrading the Australia’s broadband infrastructure. The private and public sectors have a role to play here. Second, we need to embrace the full opportunities of fixed and mobile technology convergence. We must ensure that as technology changes we are able to deliver the best broadband outcomes for all Australians when and where they need it.

Vodafone strongly supports the National Broadband Network (NBN) project. The commitment to invest in a national wholesale-only superfast broadband network will have lasting impacts on Australian society, its economy and international competitiveness and will work to overcome serious structural problems in the telecommunications sector.

In my view the NBN will play a central role in optimising the outcomes of both upgrading broadband infrastructure and enhancing the opportunities of convergence. NBN's role in upgrading fixed broadband infrastructure is well understood. What is less well known is how the NBN can assist the 'mobile revolution.'

It is important to understand that mobile services are not a competitor to the NBN; they are in fact an ideal complement. At the technology level, the NBN is a perfect enabler and facilitator for mobile. Mobile networks need fixed infrastructure to take the traffic from the mobile tower to the rest of the world. NBN can help deliver better services and increased coverage in areas where mobile coverage and competition is scarce. It can also improve mobile network performance in the cities feeding data hungry consumers.

The NBN journey commenced in 2009. Since that time, the way that people access the internet and communicate has dramatically changed. When the NBN was conceived the iPhone was only just hitting our shelves and the smartphone revolution was in its infancy. Vodafone commissioned the McKell Institute's report *Superfast Broadband: The future is in your hands* to assess how mobiles have changed telecommunications and how the NBN might provide improved services in this new paradigm.

This report by author Michael Gordon-Smith for the McKell Institute has found that with minimal re-scoping of the NBN's current activities, a broader range of compelling and exciting outcomes could be delivered for both fixed and mobile telecommunications.

This report is a timely assessment of how mobile telecommunications are changing people's lives and how the NBN can help facilitate this change and deliver greater benefits and services to consumers and business.



Bill Morrow
CEO VODAFONE AUSTRALIA



Executive Summary

The National Broadband Network (NBN) will deliver a comprehensive upgrade to Australia's national broadband infrastructure. This will be of profound importance to Australia's long-term productivity agenda.

This paper assesses new opportunities for the NBN. In particular, we examine how the growth of mobile services has transformed the telecommunications industry and how NBN has the potential to dramatically improve mobile telecommunications.

Telecommunications continues to change and so should the NBN

The NBN project commenced in 2009 as a means to upgrade Australia's fixed telecommunications infrastructure. Since then mobile broadband, smartphones and tablets have recreated the broadband landscape. We are now entering a truly converged market where mobility is a key requirement of consumers.

It is not often recognised that to deliver mobility, mobile carriers require a comprehensive fixed line network to carry voice and data traffic from a base station (mobile tower) to their exchanges and then on to the world. A national broadband network that endeavours to benefit both the fixed-line and mobile broadband networks would allow this to happen, and positively transform Australia's telecommunications landscape.

In 2013, it is time for Australia to refocus its attention on how mobile telecommunications and broadband are converging, and what policy settings are needed to drive competition, choice and coverage for mobile telecommunications across Australia.

Currently, the NBN lacks a strategy for improving mobile services but this can be easily rectified.

As well as improving fixed broadband services, the investment in fibre optic and broadband infrastructure can also deliver better mobile coverage, with no change in scope for the NBN project. The role that NBN can play in mobiles will not require a complicated reconfiguration of the NBN or its rollout.

By responding to the boom in mobile broadband NBN Co may be in a position to generate substantially more benefit for the nation with little or no increase in its costs.

Mobile technology is transforming communications across Australia

Mobile services have emerged as an essential communications platform. Australia has embraced mobile technology and this has had a profound impact on our economy. More Australians now access the internet via a mobile device than via fixed devices.

Of Australian Internet subscribers in 2012:

- 47% accessed the internet via a mobile phone; and
- 23% accessed the internet via a mobile broadband device.

Australia is also witnessing explosive growth in the use of mobile platforms for business.

More than 50% of retail, finance and property

businesses expect to offer customers a mobile website in the next 3-5 years and 48% of businesses expect to transact with their customers over a mobile application in the next 3-5 years.

The Deloitte Access Economics/AMTA “Mobile Nation” Report predicts that from 2011-2025 Mobile technologies will deliver a productivity benefit of \$11.8 billion to the Australian economy.

Australia has yet to capitalise on its investment in broadband infrastructure. This investment has the potential to drive a series of consumer, business and public benefits. To receive the full benefits we need to get the policy settings right. To unlock the potential we need to embrace mobility and deliver better competition, improved coverage and consumer choice. If we do this, we will have realised the full benefit of the investment.

Faster mobile speeds and more data in our cities

Infrastructure and technology convergence have changed the market dramatically. More than ever before, data hungry mobile networks rely on fixed infrastructure to support user demand. Convergence requires a broader consideration of what the NBN can deliver.

Mobile networks use radio spectrum to provide voice and data services. Each carrier uses a limited amount of spectrum capacity. This means that the more phones operating in a particular area covered by a mobile tower, the slower the speed of the network. The NBN fibre optic infrastructure is well placed to play a vital role in enhancing mobile broadband. The fibre network could be used to deploy more ‘micro cells’ that increase capacity in areas where data traffic is high (e.g. shopping centres, schools, cafes, universities and public spaces). This would result in faster and more reliable mobile data performance.



NBN fixed wireless cost savings and potential for private sector co-investment

In regional areas the NBN could reduce the costs of building mobile networks. Each mobile tower collects the information from mobile devices and this traffic is carried along backhaul links from the tower to the carrier's core infrastructure at an exchange centre. In other words, mobile networks need fixed-line backhaul to carry traffic from the tower to the exchange. Mobile services depend on fibre infrastructure.

The fixed wireless network would also provide a foundation for the expansion of broader mobile coverage across Australia. This would mean that the NBN could attract private sector investment and increase mobile coverage to more Australians. This is a business opportunity for the NBN: mobile use of the NBN would enhance NBN's business case and facilitate the move to converged fixed and mobile networks.

The changing face of digital communications

As technology changes and new opportunities arise, the NBN strategic objectives need to be constantly revised and updated. Changes in the environment are sufficiently large that policy-makers and NBN Co should consider whether strategic decisions made five years ago need any modification.

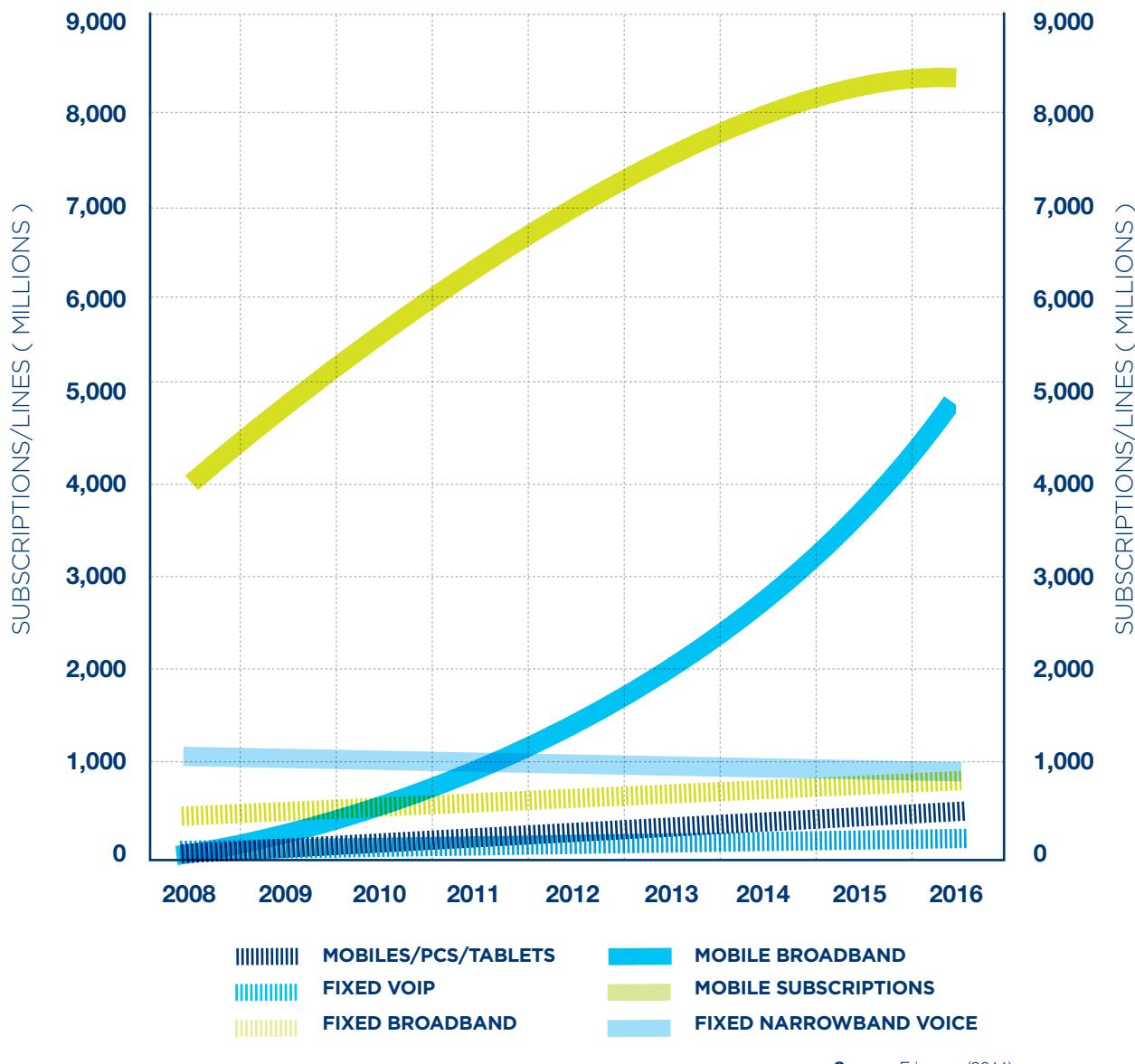
Given the changing nature of how consumers access technology and the growth and importance of mobility, it would make sense for the NBN to consider how the investment in a fibre optic network can complement the delivery of mobile technologies.

In any decisions about priorities or policies, options that quickly increase the capacity to connect mobile devices to broadband networks should be preferred. Importantly, these options are available without incurring substantial costs.

RECOMMENDATIONS

1. Changes in the environment are sufficiently large that policymakers and NBN Co should consider whether strategic decisions made 5 years ago need any modification.
2. The NBN can play a role in delivering better mobile services, both to regional areas and to cities, and it can do so without a change in the scope of the project. If the project can deliver greater benefits, without any significant increase in costs through changes to its design or delivery, this should be considered.
3. In any decisions about priorities or policies, options that quickly increase the capacity to connect mobile devices to broadband networks without incurring substantial additional costs should be preferred.

FIGURE 1
GLOBAL FIXED AND MOBILE SUBSCRIPTIONS, 2008-2016

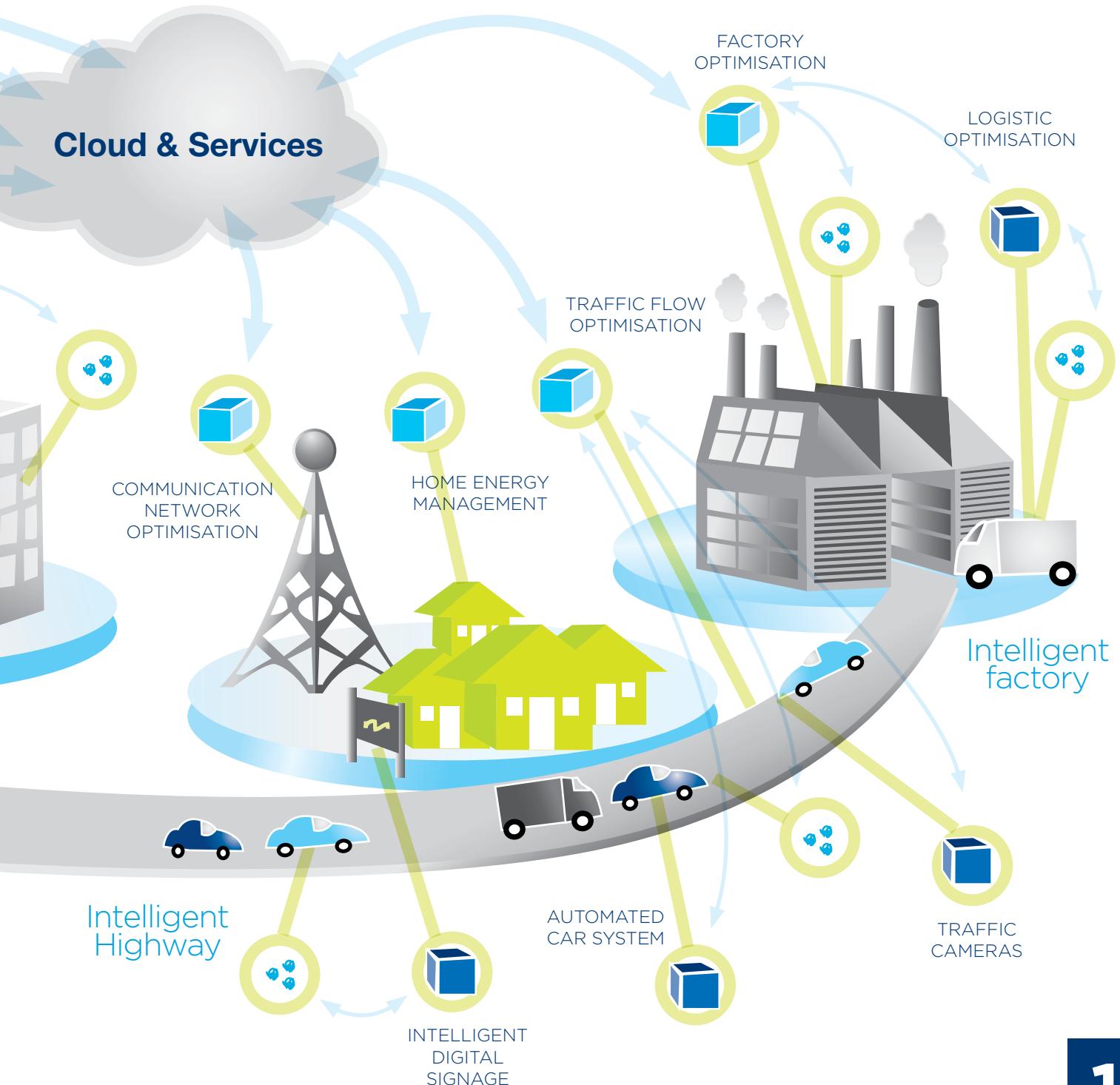


Source: Ericsson (2011)



FIGURE 2
DIFFERENT WAYS TO GET CONNECTED







1. The National Broadband Network

In the early years of the new century there was growing concern about Australia's lack of broadband capability. But Telstra was defending a dominant position in the market that came from controlling the old copper infrastructure. In 2007 the new Australian government decided to break the deadlock by funding a new fibre National Broadband Network. After a tender process failed, the government decided to build the network itself, using a new government-owned company – NBN Co Ltd.

In April 2009 The Commonwealth decided to invest in building a superfast fibre optic broadband network through a new government-owned enterprise to break a capital strike by Australia's dominant telecommunications company, Telstra.

Telstra owned the old phone lines, the copper wires that connect premises to telecommunications trunk routes. Other companies, or carriers, could build new fibre optic long-distance trunk lines or invest in modern network exchanges but to be Telstra's competitor they had first to be its customer. They would have to buy wholesale access to the copper wires that would connect homes and businesses to their exchanges. This dominant, vertically integrated position allowed Telstra to inhibit competition at the level of retail service.

In the early years of the new century there was growing community and business concern about Australia's lack of broadband capability and the lack of telecoms competition. Australia had fixed line prices among the highest in any OECD country. Concerns only increased further as other countries began to recognise modern telecommunications infrastructure as a major factor in economic growth and a potential competitive advantage, and to invest in building new networks.

Telstra continued to delay any investment in upgrading its copper local network while it was able to maintain its dominant market position. As long as the ACCC did not exempt Telstra from regulations

that required they provide competitors access to a new network at a reasonable price, there was no investment in new local fibre networks that would have had the capacity to improve Australia's access to broadband.

Frustration at the deadlock between regulators and the recently privatised Telstra led the Australian Labor Party (ALP) to adopt the creation of a new network as an election policy.

After a new Labor government was elected, it established a complex tender process, and invited proposals from potential network builders. When Telstra responded to the invitation, its proposal lacked the required documents, and the Government excluded it from the tender process.

Then, in April 2009 the Government rejected all the other proposals as inadequate to the task. It announced that instead of accepting any tender, it would fund the construction of a local network suitable for broadband services itself, through a new government-owned enterprise.

The decision to build the NBN did more than provide a way to channel investment in improving Australia's broadband. It also fixed some long-term problems in the Australian telecommunications market. In particular it promised to replace Telstra's monopoly control over local connections with a new network that would only sell wholesale, and would offer open access. The new network would not

sell its own retail services. It would therefore have no incentive to favour one retailer over another. Providers of telecommunications services would still use the same local infrastructure as each other, but now they would have access to it on the same terms. This promised a big improvement in competition. The NBN would also deliver access to high speed broadband to both metropolitan and regional areas at the same cost.

The new government-owned company, NBN Co Ltd, summarised the purpose of the new NBN in four main objectives in its 2010 business case summary:¹

- 1.** The network should be designed to provide an open access, wholesale only, national network, covering all premises;
- 2.** The technologies utilised should be fibre to 93 per cent of premises (including Greenfields developments), fixed wireless to 4 per cent of premises (delivering at least 12Mbps), and satellite to 3 per cent of premises.
- 3.** The pricing principles to be employed should ensure uniform, national wholesale pricing accessible on non-discriminatory terms; and
- 4.** The network expected rate of return should be in excess of current public debt rates.

2. The Smartphone

The iPhone introduced smartphones to the world by compressing many tools into a sleek usable device. Smartphones are the fastest growing consumer technology ever recorded. Their appeal depends on their constant ability to connect to the Internet. Consumers now have almost the same expectation of constant uninterrupted service for mobile broadband as they do for electricity or plumbing.

The iPhone changed everything. The single biggest change in communications since the Commonwealth Government decided to invest in building the NBN has been the arrival of the smartphone.

Apple introduced the iPhone in the US in 2007 and was first available in Australia in July 2008.

There had been some smart-ish phones before the iPhone. For example, many business executives had used Blackberries for emails.





But the iPhone was a revolutionary change. It was different because of the variety of things that it did, and the real promise of more to come. It had a sophisticated and versatile touchscreen that controlled the phone through an intuitive system of taps and swipes, rather than an awkward and often confusing system of buttons. It incorporated a usable camera and the already successful iPod MP3 player. It was clearly a general-purpose mobile computing device, not just a slightly improved version of what was currently available. And it was wrapped in a sleek and attractive design.

By the time the iPhone was available in Australia, it was a new model for mobile networks, and it included a GPS device. It was less like a new mobile phone and more like a portable

minicomputer that could also make phone calls. It had a new computer operating system, iOS and a year after release, in mid 2008, Apple's iTunes store opened a marketplace for third party applications. A flood of 'apps' became available, turning the iPhone into something more even than a small portable computer. Few laptops incorporated GPS devices or touchscreens. Fewer still incorporated accelerometers. Not only did someone with an iPhone have in one small device a phone, a camera, an MP3 player and a GPS tracker – for short emails and web browsing they could do without a computer as well. Using the touchscreen and the sensors, apps very quickly appeared with functions no other device could provide.



2.1 An astonishing adoption rate

Other smartphones followed the iPhone. People have been very quick to recognise their appeal and potential, to buy them, to use them, and to become strongly attached to them as a new versatile tool that can accompany them anywhere.

Over the last two decades there has been a massive increase in the use of mobile communications. The ordinary mobile phone was adopted relatively quickly by consumers. Its successor, the smartphone, has exploded into the market with astonishing speed.

The numbers are startling. This chart compares

the length of time it took for different consumer technologies to be adopted by half of all US households. The smartphone has reached the 50% mark quicker than any other, including both radio and the Internet. The smartphone has been adopted about ten times faster than the original conventional landline telephone. It took a little more than 50 years for there to be a telephone in half the households in the USA. It took a little more than five for the same proportion to have a smartphone.

The OECD reports that mobile is now the “primary communication access path in the OECD area”,² and that “wireless broadband overtook the number of fixed broadband subscriptions in 2008. In June 2012, wireless broadband accounted for 698. million subscriptions and is growing at two-digit rates.”³

FIGURE 3
FASTEST GROWING CONSUMER TECHNOLOGIES

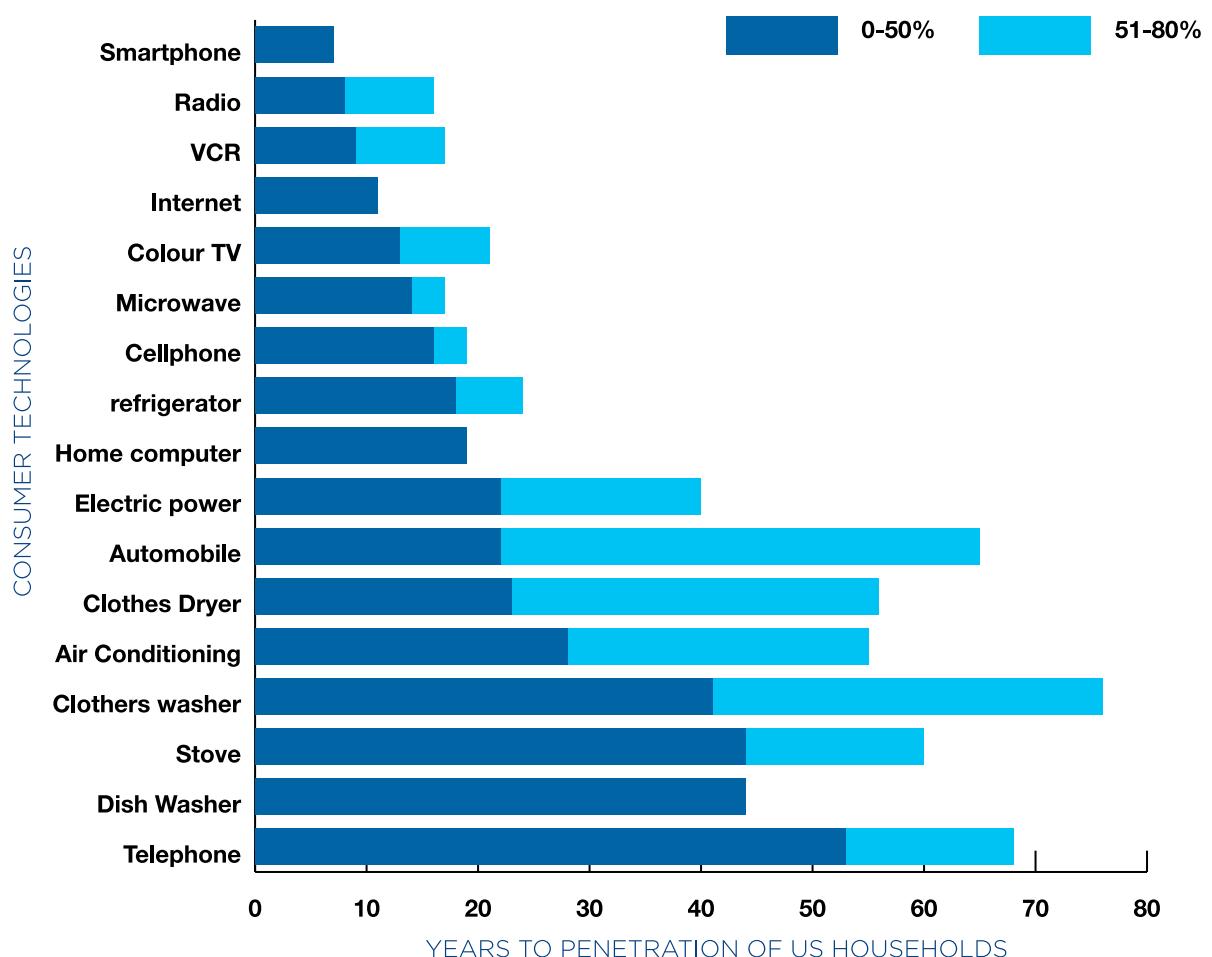
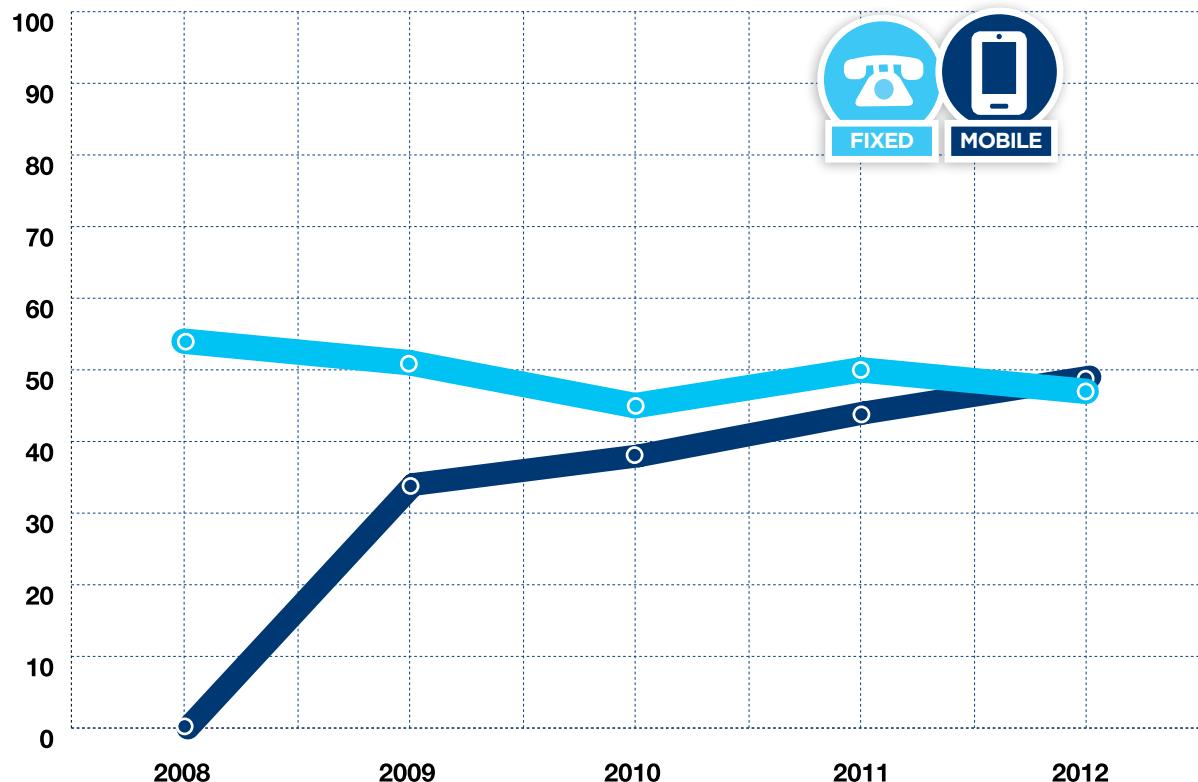


FIGURE 4
FIXED/MOBILE INTERNET SUBSCRIBERS – PERCENT OF AUSTRALIAN HOUSEHOLDS



Source: OECD Statlink: <http://dx.doi.org/10.1787/888932798544>

2.2 An explosion in data use

So many people bought smartphones so quickly that they've become commonplace. That sudden ubiquity has had an important effect. As users of smartphones began behaving in new ways, there was a social change and a general shift in the way things are done that created new norms of behaviour and new consumer expectations. The weight of those new expectations among such a large proportion of the population has had a force that businesses and organisations could not afford to ignore. For telecommunications companies, one of the biggest changes in consumer expectations has been about data traffic.

Industry forecasts suggest that this growth is likely to continue. Ericsson, for example, reports that mobile data traffic is doubling every year, and forecasts a compound annual growth rate of about 60% at least until 2016.⁴ Nokia Siemens Networks believes mobile traffic will grow a thousand-fold over the next decade.⁵

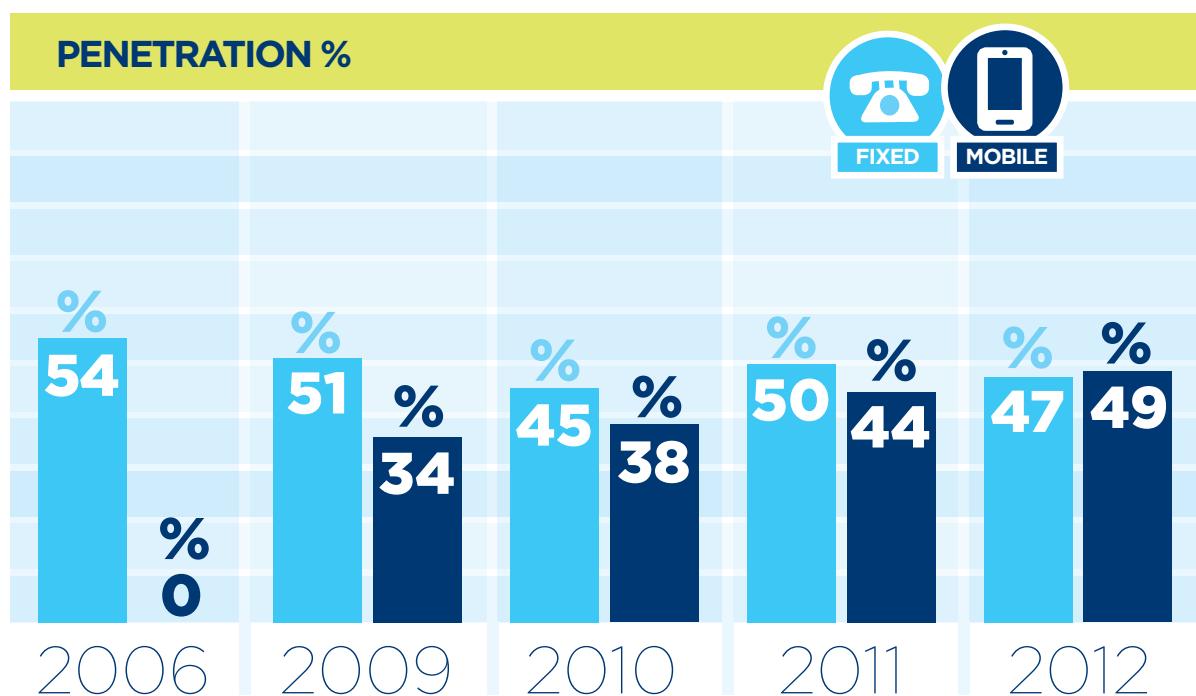
It is now an intrinsic part of the functioning of a smartphone to connect to the Internet and to use apps that depend on transmitting data; whether for sharing photographs on social networks or tracking journeys on GPS. Consumers now regard the capacity to connect wirelessly to the Internet as a utility, and have almost the same expectation of constant uninterrupted service as they do for electricity and plumbing. And unlike water and power, they expect a broadband



connection to the Internet not just at home or at the office, but anywhere (at least in any moderately inhabited area) and anytime. According to Regional Development Australia Far West NSW, "poor Internet access and mobile phone

communications are amongst the commonly expressed reasons why people elect to leave the region, if opportunity elsewhere emerges. For many people, it's become a factor in their quality of life to be able to connect, wherever they are."⁶

FIGURE 5
FIXED AND MOBILE INTERNET SUBSCRIBERS 2006 - 2012



Source: NBN Co Business Case Summary, Page 25, 4 November 2010

3. Mobile Broadband as a 'General PurposeTechnology'

Mobile broadband is the big change factor of the next decade. Economists use the term 'general purpose technologies' to describe key technological changes that have an effect across the whole economy. Mobile and wireless broadband is such a technology, and will be the key development that drives this era's economic growth.

In a celebrated interview with Gary Wolf of *Wired* magazine about the growth of the World Wide Web, in 1996 Steve Jobs said about technology:

"This stuff doesn't change the world. It really doesn't. ... We're born, we live for a brief instant, and we die. It's been happening for a long time. Technology is not changing it much - if at all. ...If the Web got up to 10 percent of the goods and services in this country, it would be phenomenal."⁷

3.1 Some technologies are more important than others

"Whole eras of technical progress and economic growth appear to be driven by a few key technologies."⁸

Mobile and Wireless Broadband is the big change factor of the next decade. It is at least as big an event as a 10-year flood. It may be so extraordinary that it's more like a 100-year flood.

The question of how much difference technology makes to growth has been of great interest to economists and policymakers. The idea of a 'general purpose technology' is sometimes used



to identify those changes that have an economy-wide effect, transforming both private lives and the ways in which business is done. Most technologies apply to a relatively small range of activities. ‘General purpose technology’ is a label used by some economic historians to describe the few technologies that have made a difference to the whole economy and been the most powerful ‘engines of growth’.

Although scholars don’t yet have an agreed consensus about the characteristics that define these few fundamental breakthrough technologies, most experts’ lists of them include steam power, electricity, and IT. Some of the features that set them apart appear to be:

- They are pervasive; they can be used in, and make a difference to a wide variety of activities and industry sectors;
- They are a sudden change from existing methods, not simply incremental improvements; and
- They lead to further innovations; they improve quickly and they complement or combine with other technologies in a wide variety of other areas.⁹

3.2 Mobile broadband is one of the big changes

Mobile broadband is pervasive. It is transforming the way work is done in a wide variety of areas. It has led to a dramatic surge in further innovations and it continues to combine with more and more other technologies, producing even more innovation. There are good grounds for considering that mobile telecommunications have the features of a general purpose technology.¹⁰

As consumers we already know that the smartphone is a remarkable and widely useful tool, but the speed with which it has become a part of our daily life risks obscuring its potential impact.

The Economist’s economics correspondent Ryan Avent put it well last year:

“The potential of the smartphone age is deceptive. We look around and see more people talking on phones in more places and playing Draw Something when they’re bored. This is just the beginning. In time, business models, infrastructure, legal environments, and social norms will evolve, and the world will become a very different and dramatically more productive place.”¹¹





4. Real-life Stories

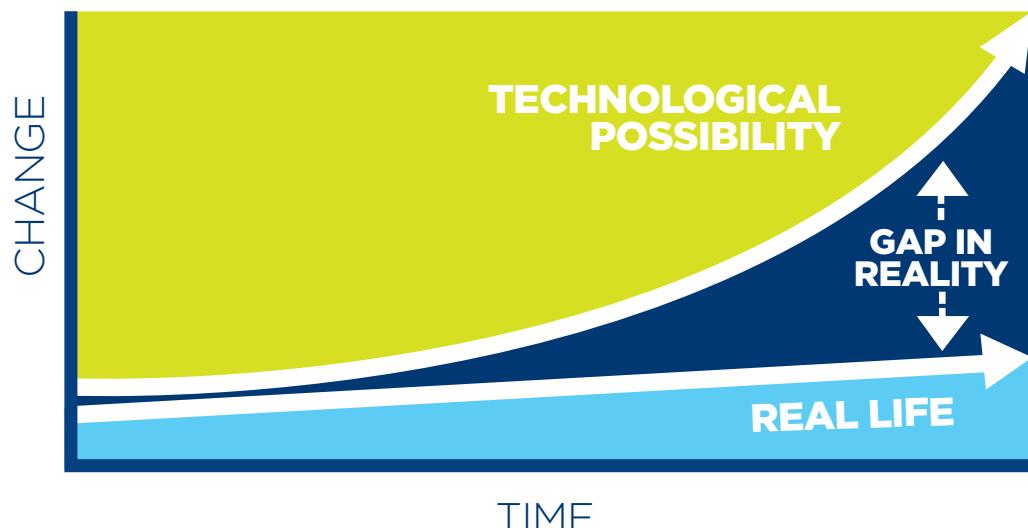
One way to get an idea of the scale of the potential impact of smartphones and other mobile connected devices is to consider the range of human activities with which they might help.

Anything people do involves sensing, connecting and acting. In both our domestic and work lives, whether for complex and important decisions or for small routine activities, we follow a broadly similar process: we gather data, place it in context and initiate a response. The data may be a physical feeling or a reading from a gauge. With wireless mobile communications our capacity for each of them is very considerably increased. Wherever we are, we can have access to immediate data about almost anything that can be measured. We can connect that data from anywhere to anywhere, either with other data or with other people to help make sense of it, analyse it or decide what to do about it.

While the changes of digital technology have been immense and exciting, they've also been the subject of a lot of hype. In a deliberately provocative magazine article in 2011, Ed Booty, Strategy Director for BBH London, suggested that "real people's lives and needs simply aren't changing at the same pace. What's possible is growing at an exponential rate, but how people actually live and use technologies has changed very little. This gap between the myth and the reality is ever-widening."¹²

Booty concludes by suggesting that instead of considering what technology might be available to people, it would be better to ask what will actually improve how they live?

FIGURE 6
THE GAP BETWEEN TECHNOLOGICAL POSSIBILITY AND REAL LIFE APPLICATION



The following real-life stories suggest that while a little scepticism is healthy, mobile technology is helping real life to catch up.

There is already a large number of inventive solutions that have used mobile data to make big differences in fields ranging from finance to medicine, from farming to garbage disposal.

Monitoring dementia

Wireless technology is revolutionising the way elderly patients manage their conditions and interact with healthcare providers. Dementia is a degenerative disease that requires regular monitoring and treatment. Before wireless technology, caring for dementia involved regular intrusive ‘mental checks’ by a visiting nurse, uprooting a patients’ life to place them under care if no friends or family live nearby, or requiring them to be constantly near a phone in case of an emergency. Wireless technologies enable patients to carry on with their lives while being properly cared for. Patients with dementia can now be unobtrusively monitored by computer vision technologies, and can have their cognitive functions checked by using a device that remotely transmits their scores in a video game or on-screen puzzle. Current estimates suggest 3 million patients worldwide use a wireless device to monitor their conditions from their homes. That number is expected to grow by 18% per annum to reach 4.9 million by 2016.¹³

Data collection

Devices like HealthPAL allow patients to collect data about their own conditions (including blood pressure, glucose levels and pulse) and wirelessly transmit it to a database that can be accessed by nurses and doctors. This minimises the need for intrusive home visits or constant trips to the hospital, and means neither healthcare providers nor patients need to suffer the opportunity cost of hours spent in transit.

Collecting patient data becomes more convenient with HealthPAL and as a result occurs more regularly. More patients provide more data to their carers more often. This is especially useful for patients who live in rural or remote areas, who sometimes dismiss early symptoms of life-threatening conditions because of the inconvenience of visiting a doctor. HealthPAL means when those symptoms arise, a patient can submit the information right away, so that healthcare providers are able to spot complications earlier and treat them before they become life-threatening.

Elderly patients

Simple problems in elderly patients like falling down or getting lost get worse the longer they take to be discovered. Falling down alone means injuries like head trauma or bleeding can get rapidly worse, and the experience of calling for help is a humiliating one. Dementia patients often wander away from their homes or caregivers because of memory loss, but they are far more likely to be found safely if they are located within the first ‘golden 24 hours’. Wireless devices mean these problems are found (and treated) faster. Wellcore has designed a fall detection system that uses a sensor to detect falls and wirelessly transmit an emergency signal to family members or carers if the person is unresponsive. Fitting a GPS bracelet to an Alzheimer’s patient means they can be located straight away when they are discovered missing from their hospital or home.¹⁴

Ultrasounds

Ultrasound technology provides the imaging doctors use to detect complications in pregnancy, or diagnose abnormalities like kidney stones and heart defects. Early detection often means more successful treatment. Wireless technology means more people can access the diagnostic tool of an ultrasound even without access to a hospital. Mobisante has released a palm-sized



ultrasound wand that a patient can use on her own abdomen, heart or pelvis. The device uses Wifi or 3G to transmit the images to her doctor or hospital. Patients far away from hospitals can use the device to check on a pregnancy or a condition and identify problems like Spina Bifida early on. GE has released a similar tool called VScan, designed for use by physicians. It can be carried like a stethoscope and means a doctor or nurse can reassure a patient with an image on the spot.¹⁵

Trucks

A number of industries depend on fleets of vehicles moving efficiently. Wireless technology is an unparalleled tool for transmitting real-time data from the drivers of each vehicle to the manager of the fleet. US telecommunications provider AT&T has launched Fleet Management Solutions, which uses GPS-enabled wireless devices to track each driver's location. Fleet managers can then send the closest driver to the nearest job, keeping down fuel costs. Larger fleets can use electronic monitoring to decrease engine idling, which wastes a gallon of fuel an hour. Telogis Inc found that simply alerting drivers to excessive idling can decrease it by 50%, saving \$3,600 in fuel costs per vehicle, and avoiding 20 million pounds of CO₂ emissions. Wireless technology in fleets improves life for the driver as well. Wireless technology means each driver can use their device to log the precise times of their shift, helping fleet managers to monitor fatigue and send alerts to at-risk drivers.¹⁶

Agriculture

Manufacturer John Deere uses wireless fleet management technology in an agricultural setting. Its app, JDLink, gathers information from each tractor and harvester in a farmer's fleet and transmits a maintenance alert to their phone when necessary, along with the machine's location. Pre-emptive

maintenance keeps costs down for the farmer by solving problems sooner. The pool of information gathered from each machine means that driver and machine efficiency can be monitored across hundreds of acres of crops and GPS information means stolen or broken machines are quickly recovered.

Garbage

Waste management is an industry that has high levels of environmental impact. Garbage trucks have to drive to many areas across the country to collect business and household waste and deliver it to a plant where it is treated, sorted and disposed of. Wireless technology helps eliminate wasted trips, and therefore wasted fuel. Devices attached to bins can monitor how full they are and transmit that information to waste management HQ, so that a truck only makes a journey when garbage needs to be picked up. BigBelly Solar in the US uses this system with two components: an electric eye that tells a compactor when to compress garbage, and an SMS system that alerts central dispatch when garbage can no longer be compressed. This two-step process reduced garbage truck collections by 70% in Philadelphia and saved the city \$720,000 in operating costs.¹⁷

Hazardous waste

Hazardous materials can cause environmental damage and spillovers or plant faults create mess and therefore cleanup costs. Wireless devices in garbage identify problems early and ward off these dangers. Monitors can detect density in garbage that indicates the presence of concrete or another hazardous material, so that the collecting truck knows to correctly dispose of the material. Garbage systems such as compactors can be fitted with devices that sniff out internal mechanical failures or fuel leaks and transmit maintenance alerts so the problem is fixed before garbage piles up or spills over. Some problems can even be fixed remotely by a string of wireless devices.

Domestic violence

People in violent relationships often struggle to access the services that are designed to protect them. Going to a police station or a crisis centre requires independent mobility which victims of violence may not have, and a phone call is out of the question if the violent partner has access to the victim's phone records. Wireless devices have empowered people in violent relationships by being present in crisis situations and transmitting information to people who can help. Aurora is an app released by the NSW government that sends a distress signal and a location to police and friends, while FightBack is an app in India that updates a victim's Facebook status to their location and their need for help. TecSOS, a philanthropic Vodafone creation, is a standalone device that uses one button to give police the location of a current attack and records the noise around the victim. TecSOS phones led to at least one successful prosecution in December 2012.

Education

Textbooks are important but not all students can access them. They are expensive and get lost and damaged. Wireless devices can download digital textbooks that are quickly updated, interactive, and cheap to access. The US Department of Education finds that children achieve objectives up to 80% faster when using digital learning, and e-readers allow students in underserved areas to wirelessly access up-to-date information. The iRead program in Ghana is an offshoot of the WorldReader project, which distributes e-readers to sub-Saharan Africa. In a seven month pilot program, iRead gave devices with wireless connectivity to Ghana schools who previously had as few as ten books for the entire student population. Students downloaded up to date textbooks and interactive grammar and literacy apps. Students in the e-reader program at a primary level experienced a 19% bump in writing scores.¹⁸

Mobile money

Financial liquidity has depended on banks for many decades. A consumer needed a bank account to electronically transfer money; but 2.5 billion people do not have bank accounts. Mobile technology is bringing financial services to those people. M-Pesa, launched in 2007 by Kenyan Telco Safaricom, lets users hand cash to a Safaricom agent at a corner shop, who credits the amount to their M-Pesa account. Mobile devices can then use M-Pesa to wirelessly pay bills or salaries, finance loans, or send money to relatives in rural villages. The consumer no longer incurs the cost of a bank handling their account, or the risk of carrying cash in developing areas. M-Pesa is expanding through Africa and the Middle East and can fill the financial security void created by political crises; in Nairobi in 2008, after electoral violence, M-Pesa users did not need bank accounts to send money to relatives trapped in slums. In its embryonic stage in Kenya, M-Pesa increased the income of rural households by 5 to 30%.

It might be too early to tell how much technology may change the fundamentals of human experience, but for the practical operation of day-to-day life – what can be done, which business models succeed, how work is organised and who does it – even Steve Jobs, one of the more celebrated visionaries of the business, underestimated the impact of the technology he was helping to create.

Each new case study is a source of inspiration for other innovators and the germ of an answer for another problem. After even a brief look at what mobile broadband has made possible, it's not surprising that several evaluations suggest it will also have a very large impact on businesses and national economies.



5. Impact on Businesses and Nations

Mobile Broadband is a disruptive technology that changes the way the economy functions. Mobile data use promotes increases in GDP per capita growth. Smaller firms can access tools and processes that help them rival larger firms. This change is going to continue in Australia as mobile data grows fourteen-fold by 2016.

5.1 Transaction costs

Ronald Coase won the Nobel Memorial Prize in Economics in 1991 partly for his work in the 1930s in a seminal paper called 'The Nature of the Firm'. Coase explored questions that had until then escaped much critical investigation: why are there firms and why are they the size they are? He pointed out the importance of transaction costs - the costs involved in organising work through the marketplace. They include the costs of finding, making and managing contracts, co-ordination, and allocating resources, and are sometimes summarised as:

- Bargaining and decision;
- Enforcement and policing; and
- Search and information costs.¹⁹

It is an area that has seen much research and development since Coase's pioneering study, but it is still clear that the way these tasks are done is an important influence on the size and shape of

organisations and on the relations between them. Many of the big disruptions to business models caused by the Internet relate to the capacity it delivered for handling these transaction tasks more cheaply or quickly. Massive reductions in transaction costs inevitably have consequences on the boundaries of firms and on the coordination and organisation of work, as well as making possible new forms of organisation. The Internet has produced Wikipedia and the Open Source software movement, as well as Google, Amazon and Seek. Mobile broadband is now delivering all the disruptive potential of the Internet to anyone, whenever and wherever they want it. In the process it is rapidly making obsolete the core activities or core assets of some firms and providing new opportunities for others. Thousands of start-ups are vying with more established firms by designing tools and processes to:

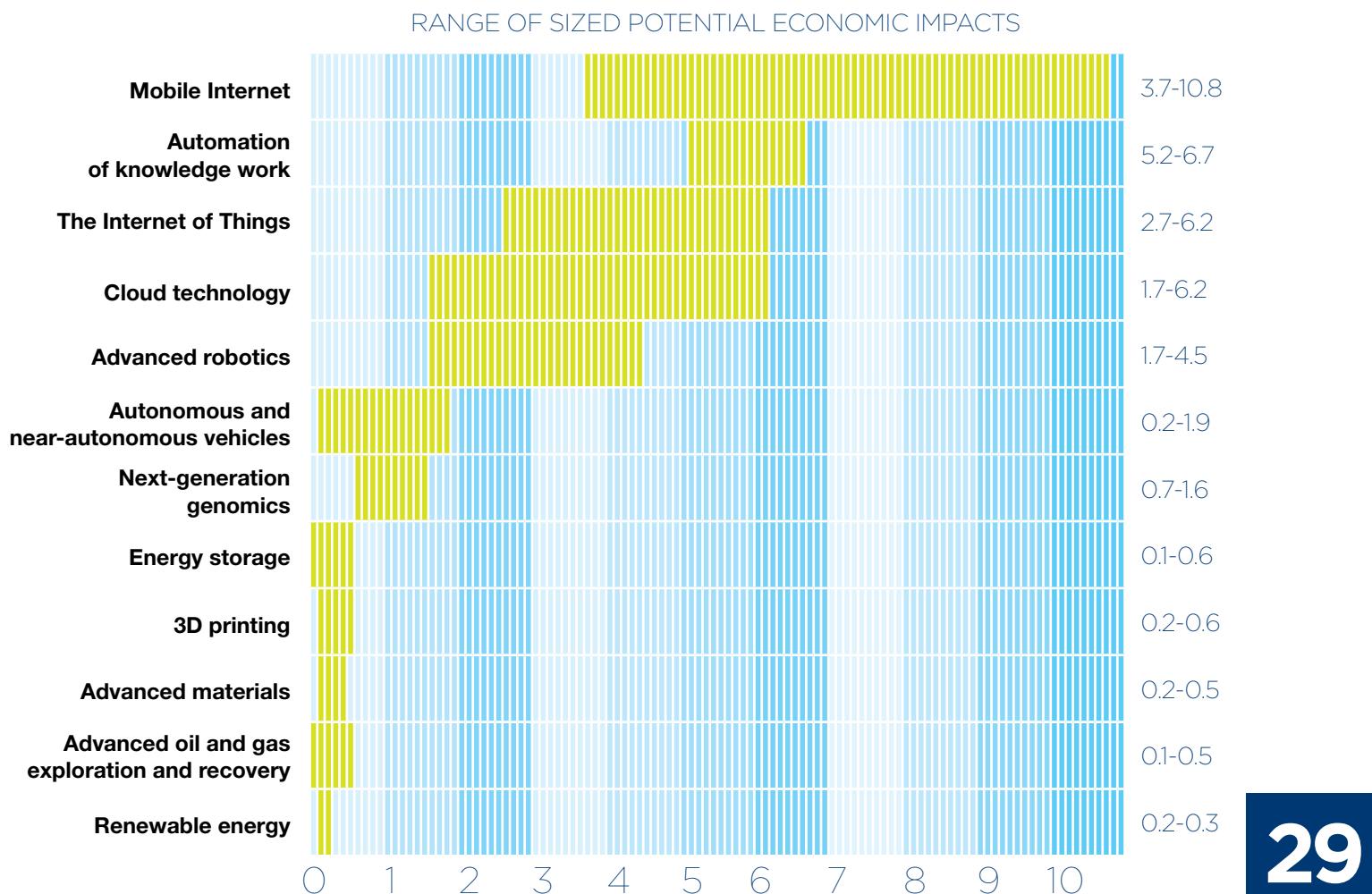
- Provide quicker access to, and new sources of data;
- Manage risk,
- Make transactions easier;
- Match supply and demand;
- Optimise resource use
- Reduce the need for transport;
- Take measurements
- Turn on or off, remotely, anything with a switch.

5.2 GDP

In May this year, the McKinsey Global Institute published a major report on disruptive technologies, to identify the technology areas “with the potential for massive impact on how people live and work, and on industries and economies and assessed more than 100 possible candidate technologies.”²⁰

The table below shows McKinsey’s estimates of their potential economic impact. Notwithstanding the cautions they make about their figures – they include potential direct impact only, estimate economic benefit to consumers rather than GDP, and were not comprehensive – it makes very clear the enormous scale of the potential impact of mobile Internet.

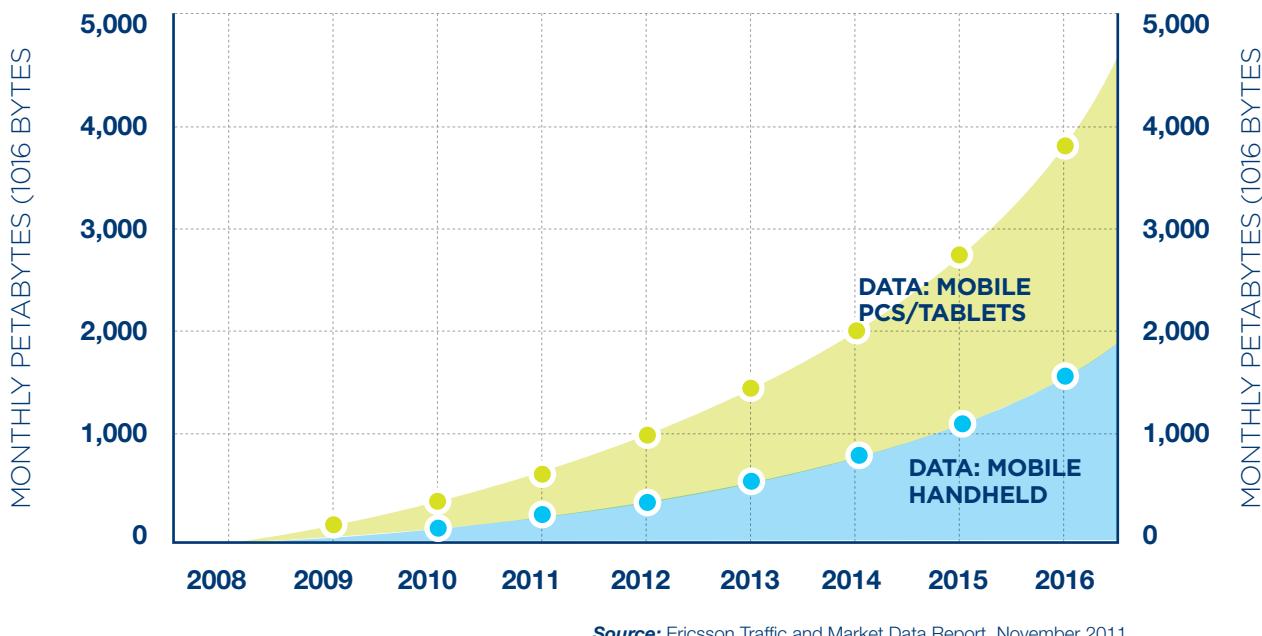
FIGURE 7
ESTIMATED POTENTIAL ECONOMIC IMPACT OF TECHNOLOGIES FROM SIZED APPLICATIONS IN 2025, INCLUDING CONSUMER SURPLUS \$ TRILLION ANNUAL



Source: McKinsey Global Institute analysis



FIGURE 8
GLOBAL MOBILE TRAFFIC DATA, 2008-2016



Source: Ericsson Traffic and Market Data Report, November 2011

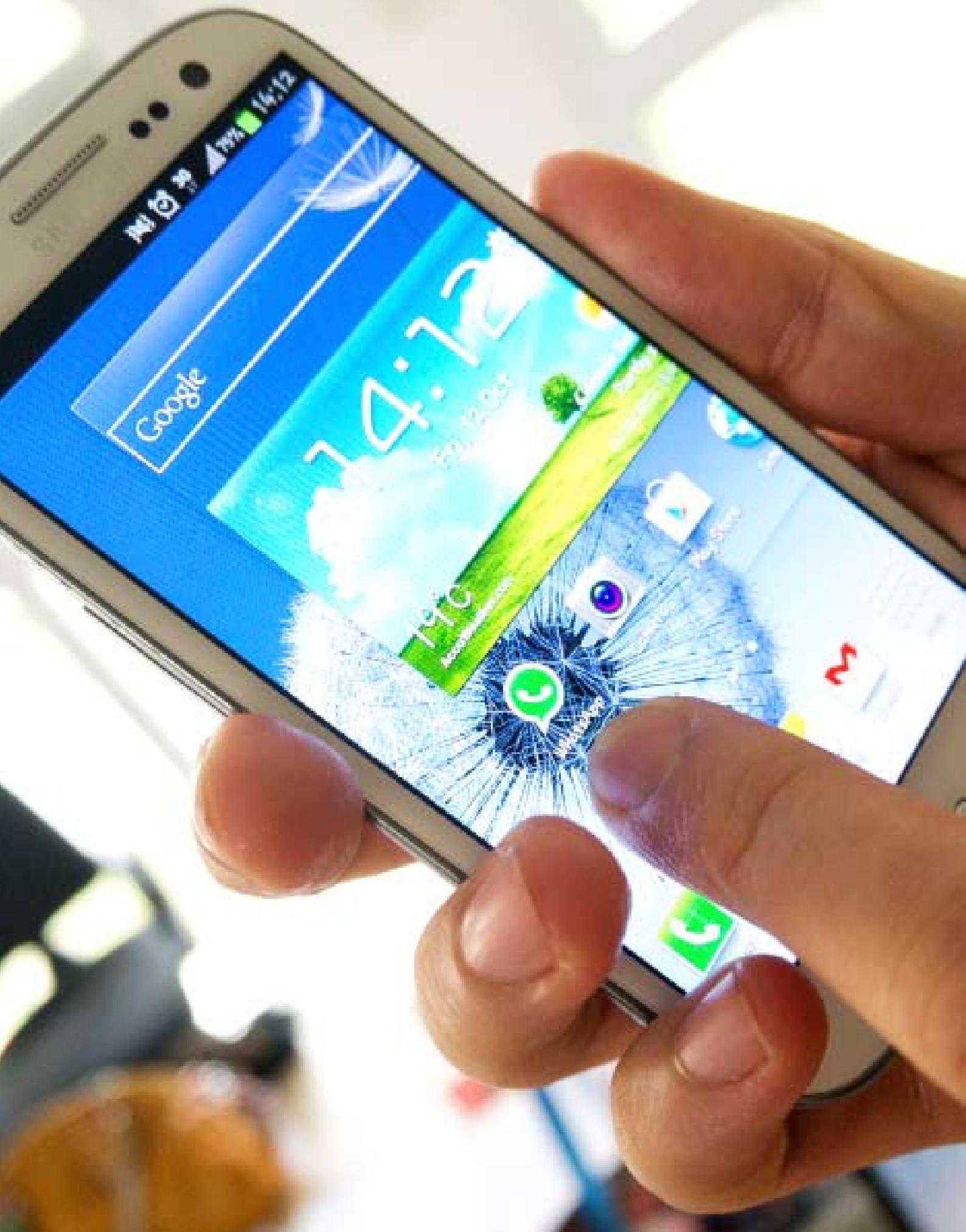
Other studies have attempted more directly to measure the impact on GDP. A 2012 econometric study by Deloitte in conjunction with Cisco and the GSM Association, *What is the impact of mobile telephony on economic growth?*, concluded that “a doubling of mobile data use leads to an increase in the GDP per capita growth rate of 0.5 percentage points”. If that continues, the cumulative effect will be very important for national and global economies.

5.3 There's more to come

A separate forecast by Cisco Systems estimated that demand for mobile data traffic in Australia would grow by a factor of 14 in the five years from 2011 till 2016. Its Chief Technology and Strategy Officer Padmasree Warrior suggests we've only just begun to connect the things that can be connected. She estimates that only 1% of what can be connected in the world is yet connected:

“As an industry, it took us about 20 years to connect 1 percent of the world. And in the next ten years, we believe that number will go up dramatically. We'll make significant progress in connecting the 99 percent that's still unconnected. That will be people, that will be devices, and that will be a lot more information on the network.

“So when we say “the Internet of Everything,” we mean an intelligent way to connect processes with data and things. Not just the Internet of Things, not just connecting the devices onto the network, but how can you use the information that's being collected to drive better processes, better decision making for businesses, and better lifestyles for users and consumers? And we mean more efficient ways to analyse that data through analytics from the network—which is our expertise—to make every single vertical (manufacturing, retail, transportation) significantly different than what it is today.”²¹





6. Network Convergence

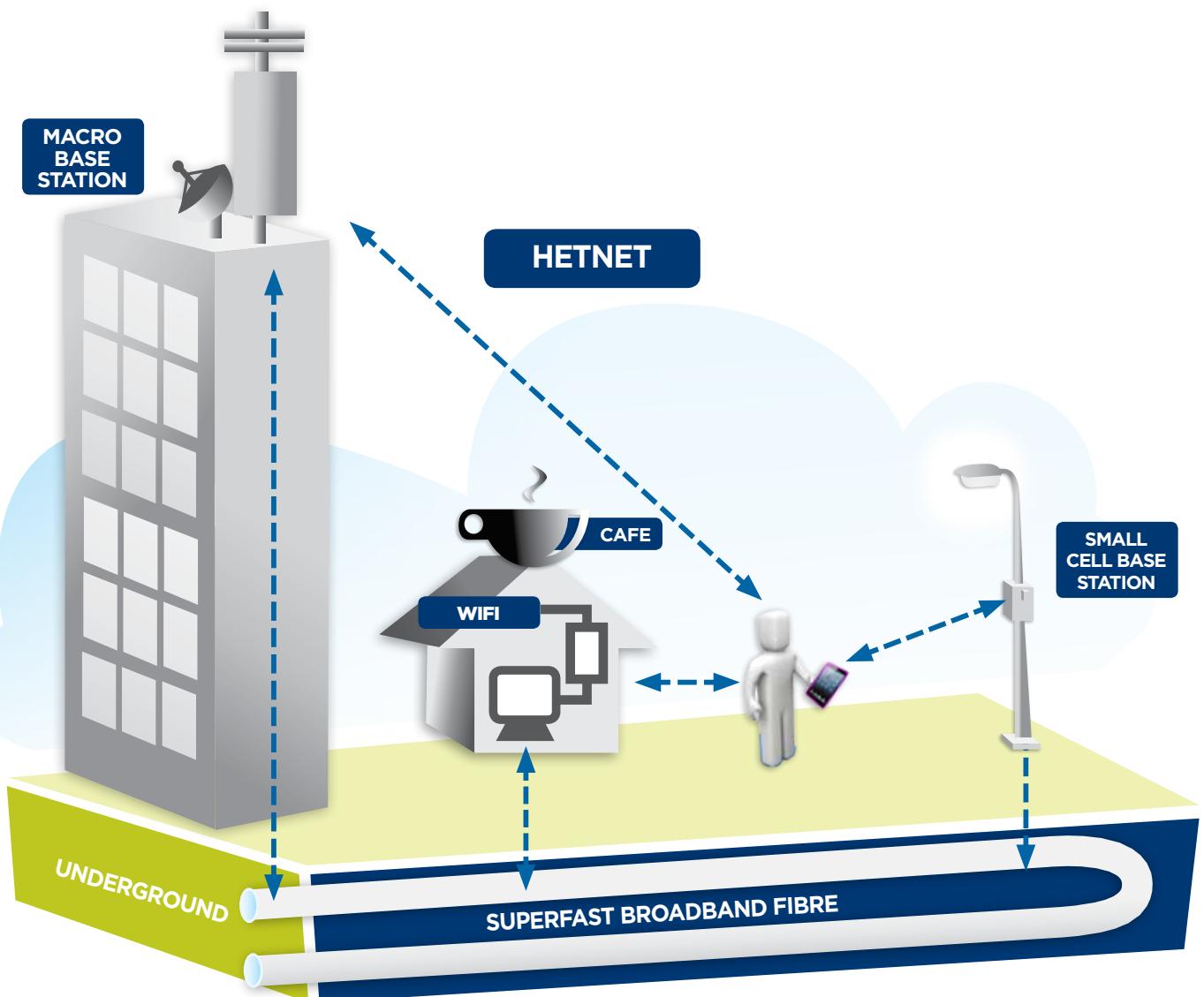
Smartphones can connect to the Internet using either a Wifi network or a mobile network. This dual capacity is part of a convergence between previously distinct kinds of broadband delivery. Although many consumers and policy-makers are unaware of it, this convergence means a superfast network has benefits beyond fixed line services.

The scale of the mobile broadband revolution can add to the impression of mobile as a whole new system. It can seem as though, when someone swaps a landline handset for a mobile phone, they also swap an old fixed line network for a new mobile network. In fact, mobile and fixed network infrastructures are being used together in a variety of combinations. Fixed services regularly connect to wireless devices, for example by using wireless routers, and mobile services rely heavily on fixed line infrastructure to carry traffic from the wireless cell, such as transmission links from a base station, or Wifi in an airport.

'Convergence' has been very widely used as a term to describe changes in the communications and media industries. Nicholas Negroponte, the creator of the celebrated MIT Media Lab, is widely regarded as having been the first person to use it, as far back as 1973, when he began to forecast a growing overlap between the film and broadcast, computer, and print and publishing industries.²²

Negroponte's 1995 best seller *Being Digital* helped to popularise the idea that as the boundaries between previously separate industries become blurred, their products and activities become less distinct and they begin to combine.²³ It's not a process unique to the media and communications industries, but the term has become almost synonymous with them. When the Commonwealth Government initiated a review in December 2010 to look at whether technological change had necessitated a change to Australia's media regulations, it was called simply The Convergence Review.

FIGURE 9
HETNET



Fixed, wireless and mobile technologies
all rely on the same underlying infrastructure.



The smartphone embodies the change that Negroponte saw coming. It is a ‘converged device’ that integrates into one tool a variety of sensors and previously separate devices and connects them all to communications networks.

Smartphones also demonstrate, and accelerate, what is sometimes called ‘fixed-mobile’ or ‘network’ convergence. Smartphones connect users to networks in different ways. They can do it through a mobile phone network. They can also do it through a home or office wireless local network (WLAN). In many homes the last few feet of cable that used to connect the router to a computer or an exchange to a telephone have been replaced by wireless. Some 64% of Internet connected houses have Wifi.

Deutsche Telekom’s chief technology officer, Olivier Baujard, recently told a Broadband World Forum that for many people, the experience of using a mobile handset “[is] more a wireless experience than a true mobile experience”, and that “in reality they use mobile handsets for fixed usage.”²⁴

However from the user’s point of view the experience is identical. There is no significant difference between connecting a device to a network by Wifi on a 2.4GHz frequency or by 4G mobile on an 1800MHz frequency. If a device is within range of any wireless connection, the only reason to care about which frequency is being used is the price charged for access.

It might be more accurate to say that for many people now, the biggest value of a fixed network is to connect to mobile devices.

When the iPhone was introduced, mobile phone networks were set up to provide for voice traffic, SMS, and a few emails. Mobile telecommunications companies, the signal carriers, were still employing the ‘walled garden’ as a business model. They placed tight constraints on what could be done on their networks. They owned the relationship with the customer so third party developers had no way to market their services or apps to the people who used phones or any other devices that connected to the network. The iPhone changed this structure completely. Some carriers turned Steve Jobs down

when he wanted to secure their agreement that iPhones could be used on their networks. But once the iPhone was in the marketplace the tide of consumer demand became too strong. Even the most reluctant mobile carriers had to allow smartphones to operate on their networks. The walls around their gardens fell and released a rush of innovative energy from developers.

At the time, the contributing editor of *Wired* magazine, Fred Vogelstein observed: “Eventually this will result in a completely new wireless experience, in which applications work on any device and over any network. In time, it will give the wireless world some of the flexibility and functionality of the Internet.”²⁵

It didn’t take much time at all. The boundaries between wireless and fixed broadband services are blurred, both in what they’re used for and in how they’re delivered. Consumers increasingly use them for the same purposes. As the Internet Protocol has been more widely adopted in telecommunications networks they can use much of the same network infrastructure.

This ‘network convergence’ means that the benefit of Australia’s massive investment in a superfast broadband network is not limited to fixed line services. It may also improve Australia’s capacity to capitalise on the extraordinary potential of wireless broadband.

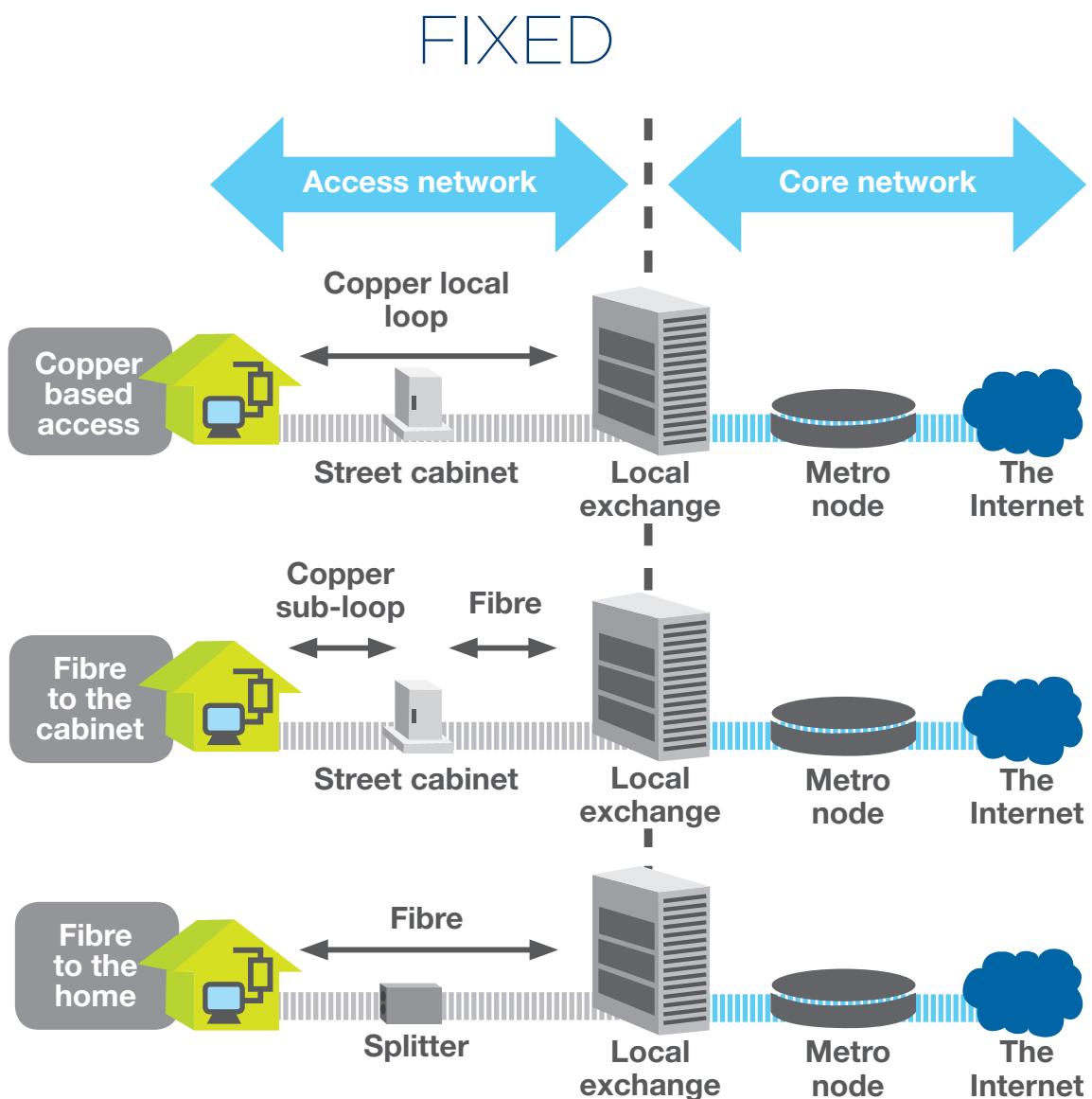
Like the tank commander Oddball in the film Kelly’s Heroes, most people only ride their mobile phones. They don’t know what makes them work.

Without the need to learn the technical details it’s easy for an ordinary person unconsciously to view ‘mobile’ and ‘landline’ networks as almost distinct, unconnected systems. Despite the high profile of the NBN and the political debates connected with it there are still many people – and some elected officials and policy-makers – who remain unaware of how the new fibre will fit into existing telecommunications services, and in particular of how it might also make a difference to the delivery of mobile broadband.



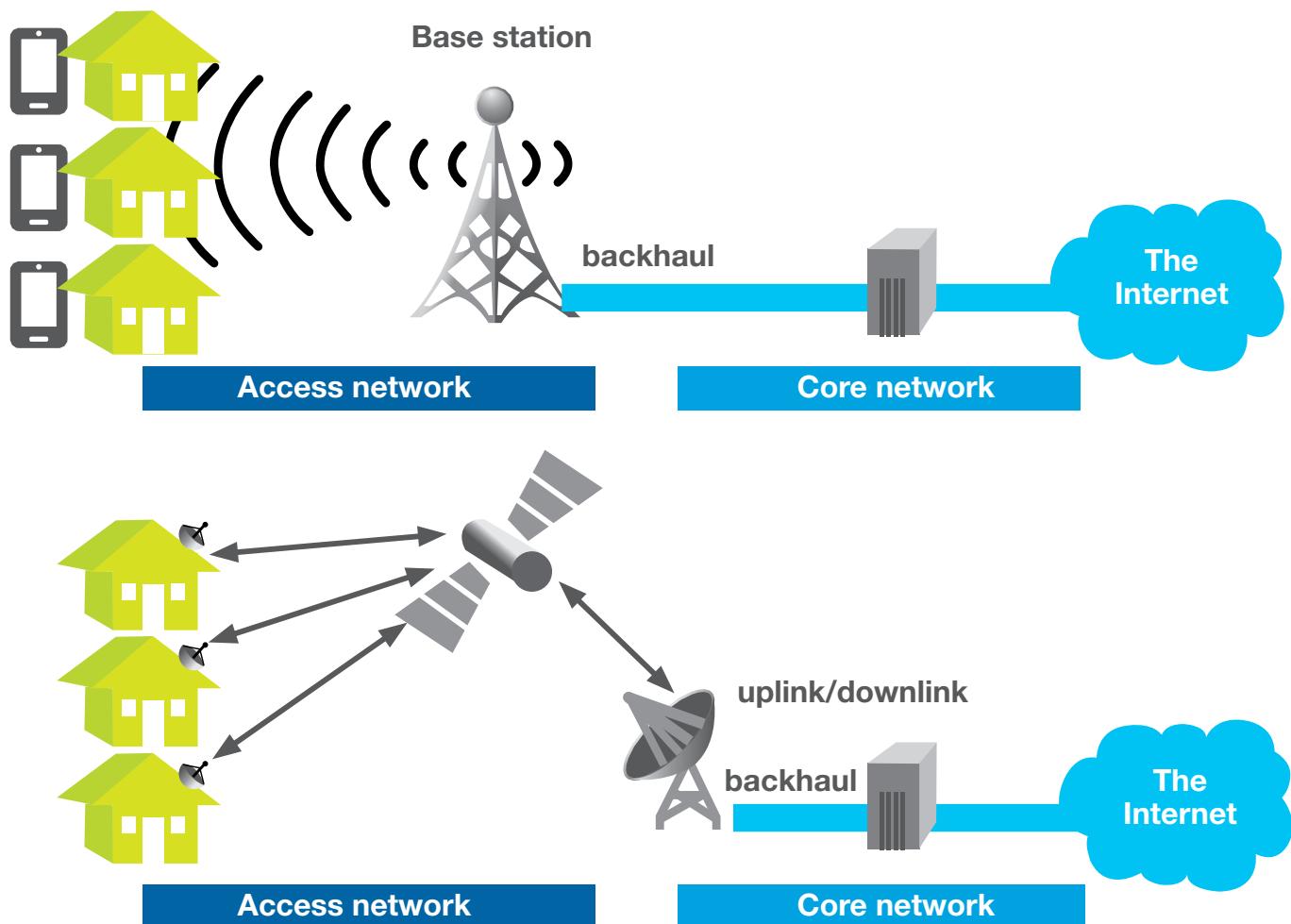
FIGURE 10
DIFFERENT WAYS TO GET CONNECTED

Representations for fixed and wireless broadband connectivity



The NBN can help to deliver both fixed, wireless and mobile services. All require transmission/backhaul to carry data traffic. NBN can play a role in improving and expanding mobile services in regional and metro areas as well as improving fixed and wireless broadband.

WIRELESS



Source: DCMS, Policy Exchange, "The Superfast and the Furious", 2012



7. The NBN in a Changed World

The world has changed since the NBN project began. Its purpose is as important as ever, but in the context of rapid change decision-makers should constantly consider whether strategic decisions made five years ago need modification.

Now is a clear time for review.

7.1 The same objectives in a new context

Telecommunications in general is particularly important for Australia. In its report to the Council of Australian Governments in 2008, Infrastructure Australia said “It is difficult to overstate the importance of telecommunications to national productivity.” Writing at an early stage in the smartphone revolution, it advised that “Telecommunications, such as broadband and 3G telephony, represent an opportunity to achieve the kind of connectivity historically enjoyed by smaller, more densely populated nations closer to global markets. Finally the competitive disadvantage described by historian Geoffrey Blainey as Australia’s ‘tyranny of distance’ can be overcome.” The Government’s decision to invest in the construction of a superfast broadband network was shaped by a similar perspective: for nation-building, for productivity and innovation, for education and health services, for connecting regions, for future growth and competitiveness.

The last five years have done nothing to diminish the overall significance of telecommunications and the need for a superfast broadband network. If the same assessment about infrastructure priorities were to be made now, Infrastructure Australia’s general conclusion about the importance of telecommunications would still be unassailable. But it would be impossible to overlook the story of the iPhone, its smartphone successors and the transformative potential of wireless broadband.

7.2 Costs and benefits

As we re-examine the NBN it will be important to recognise the benefits it can deliver.

Some commentators pointed out that investments in building nation-sized networks like railways or the original copper telephone system had led to large unanticipated benefits. A short-term firm level cost-benefit analysis of the NBN project would not take into account the likelihood that it would have such an effect. There were likely to be very large benefits to the nation from a superfast broadband network, but these would be missed by an analysis that counted only the immediate commercial fortunes of the builder of the network, NBN Co. The factors affecting the costs of the project could at least be identified, but it was more or less impossible to guess at the benefits, the most important of which were as yet unseen developments that would resemble the transformational effect of networks like railways.

It was also argued that the benefits could not be assessed in any meaningful way because they were uncertain.²⁶ This reasoning sits in the mould created by economist Frank Knight's suggestion almost a century ago that we should use 'risk' to mean measurable uncertainty and 'uncertainty' to mean unmeasurable uncertainty.²⁷ This is an unnecessary tangle of confusing definitions contrary to ordinary usage that leads to the idea that it is impossible to reason usefully about decisions under uncertainty.

It is implicit in the Government's decision to build the NBN that it believed the size and chance of reward to Australia were worth the risks. It would make no sense for the Government to have considered it only a remote chance that productivity would improve or that there would be long-term benefits but to have incurred substantial costs anyway.

As decision analyst Douglas Hubbard points out, when a view is taken that further measurement

or assessment is impossible, we stop trying to measure. "As a result, decisions are less informed than they could be. The chance of error increases. Resources are misallocated, good ideas are rejected and bad ideas are accepted. Money is wasted. The belief that some things – even very important things – might be impossible to measure is sand in the gears of the entire economy."²⁸

There were strong grounds for believing that a lack of investment in broadband infrastructure was impeding Australia's competitive position. There was also reason to believe that new broadband infrastructure would have substantial benefits for Australia's productivity and lead to a range of further benefits.

However, the NBN was not a single decision. A series of further choices were involved in the architecture of the network, the priorities for rollout, and the services it will offer. These choices should also be assessed in terms of how likely they are to deliver the broader benefits of productivity and innovation and regional connection. Avoiding a broader cost benefit analysis creates a risk that more decisions will eventually be made with the short-term firm level analysis.

7.3 How to increase the chance of benefits

The environment has changed since the project began. There have been some changes in forecasts of costs and timelines.

The world has changed since the NBN project began. Its purpose is as important as ever, but in the context of rapid change decision-makers should constantly consider whether strategic decisions made five years ago need some modification.



7.4 Recommended but not yet adopted

It's a plausible working hypothesis that the single best way to improve the economic development of regional areas, and possibly Australian productivity overall, would be to provide affordable mobile broadband. The importance of delivering both fixed and mobile broadband has been identified by a number of recent studies, but it has not yet been embraced by government or the NBN Co as the top priority it deserves to be.

In February this year, the fourth report of the Review of the Rollout of the NBN recommended that the Government support NBN Co to explore the synergies between fixed and mobile telecommunications networks with a view to using the NBN to improve mobile telecommunications, particularly in regional and remote areas.²⁹

The Sinclair Regional Telecommunications Review reported "People living, working and travelling in regional Australia constantly told the committee that mobile coverage remains the major concern." It found that individuals and organisations in many regional communities wanted greater clarity around NBN Co's rollout program and network extension policy, and also recommended using the NBN to improve mobile coverage.³⁰

And in June this year, the Government recognised the importance of mobile technology for its own operations when it issued a road map for adopting mobile technology across the operations of government.³¹

The central principle should be to assess priorities and policies in terms of their likely risks and rewards. One or two examples will illustrate the potential for the NBN to make a difference to the speed with which Australia increases its mobile broadband capability.

7.5 Heterogenous Networks (Hetnets)

One relatively recent development is the creation of much smaller mobile base stations. Called micro cells,³² they can deliver reliable mobile signals in built-up or high-traffic areas and they are unobtrusive enough to sit on a lamppost. They can operate as part of the same network as the larger higher-powered macro cells that sit on towers and building roofs. Networks that use different types of cells are known as heterogenous networks, (or in industry jargon 'hetnets').

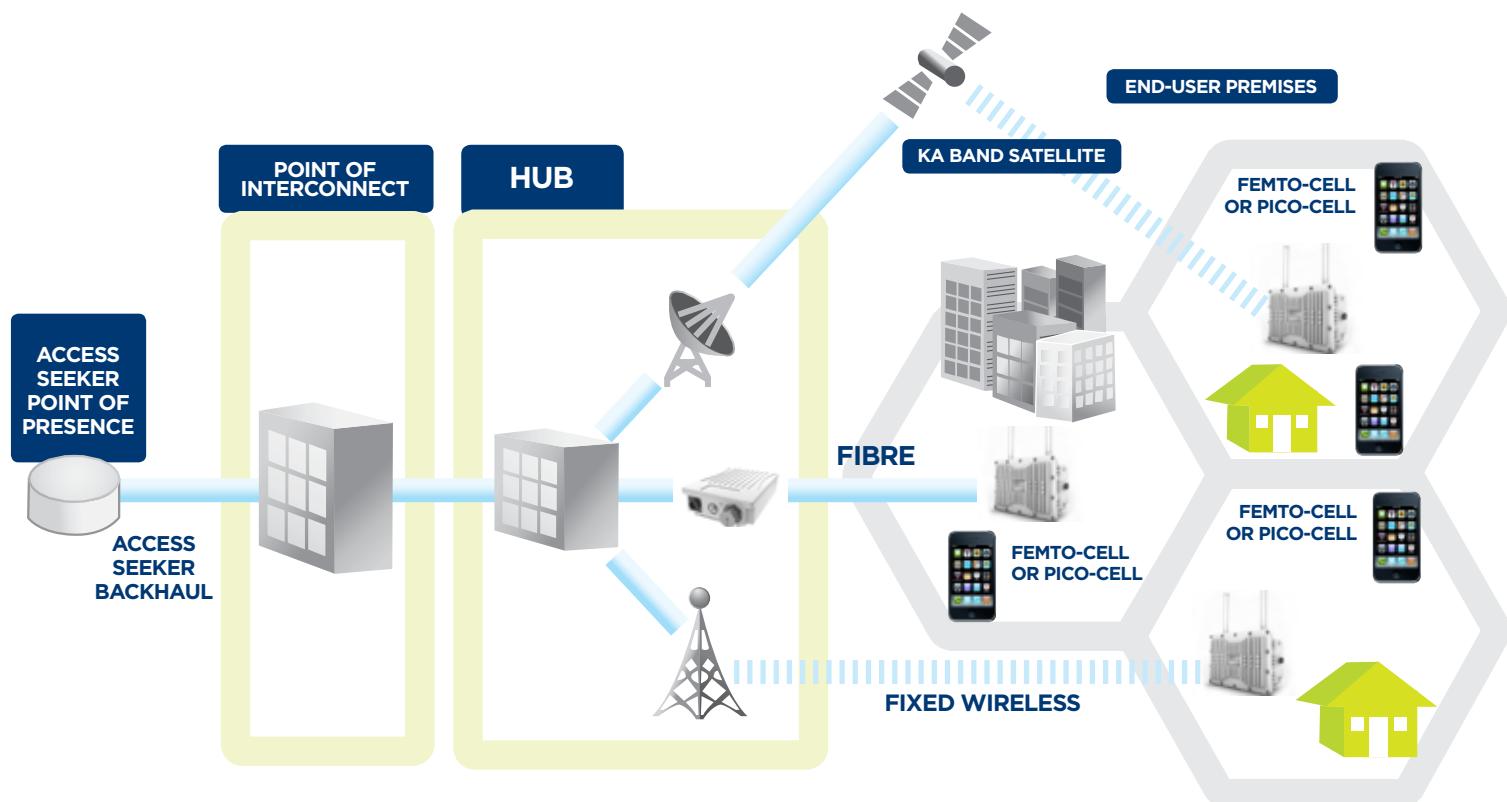
The smaller cells have several advantages. They can improve coverage in buildings and built-up areas. They can also improve the performance of the network as a whole by removing some of the load from the larger cells. However, each small cell needs to be connected to and coordinated with the network. This connection between the cell and the central core network is often referred to by the confusing trucking metaphor of 'backhaul'.

Lin Luo and others from the Institute for Telecommunications Research, at the University of South Australia, recently suggested that hetnets "could become one of the 'killer apps' of the fibre-centric NBN."

A fibre-to-the-premises network could, according to Luo, "eventually complement existing mobile core networks to facilitate 'mobile-over-fibre' and 'fixed/mobile convergence', which are promising and viable solutions for beyond 4G."

Figure 11 illustrates this proposal.³³

FIGURE 11
NBN ARCHITECTURE AND SMALL CELLS BACKHAULED BY NBN



Source: Telecommunications Journal of Australia, Vol. 62, No. 1. Lin Luo, Linda Davis and Alex Grant

7.6 Emergency services and regional broadband

The Sinclair Report³⁴ identified the reliability of communications during emergency situations, especially mobile communications, as a major concern for people in regional areas. The Commonwealth Government, in partnership with the States and the mobile carriers has launched a National Emergency Warning System (NEWS) requiring mobile carriers to send their customers a warning SMS from emergency services during

times of bushfire, flood or cyclone.

This has placed an additional need to ensure that regional areas and bushfire or cyclone prone areas receive adequate mobile coverage.

There are strong debates underway about the best way to provide dedicated emergency services in those areas and about the substantial cost involved in establishing an effective national network. The biggest impediment to greater coverage in these areas is the cost of infrastructure.

It would make sense to consider how the NBN could be used to help deliver better services to regional areas, and how to meet the needs of



emergency management agencies.

There are also concerns that regional areas without effective mobile broadband coverage will be seriously disadvantaged and miss out on the social and productivity benefits it can deliver.

Those costs could be substantially reduced if NBN Co were to provide fibre-to-base station sites.

As well as providing a way to lower the cost of developing an emergency network, if the NBN Co were to provide fibre-to-regional base station sites, it would also improve the likelihood of coverage

expansion by mobile carriers and increase the capacity and competition in regional mobile broadband. In a manner similar to the competition produced by access to the local access network, competition is maximised when fibre is available to all operators as a common input cost.



RECOMMENDATIONS

1. Changes in the environment are sufficiently large that policymakers and NBN Co should consider whether strategic decisions made 5 years ago need any modification.

2. The NBN can play a role in delivering better mobile services, both to regional areas and to cities, and it can do so without a change in the scope of the project. If the project can deliver greater benefits, without any significant increase in costs through changes to its design or delivery, this should be considered.





Conclusion

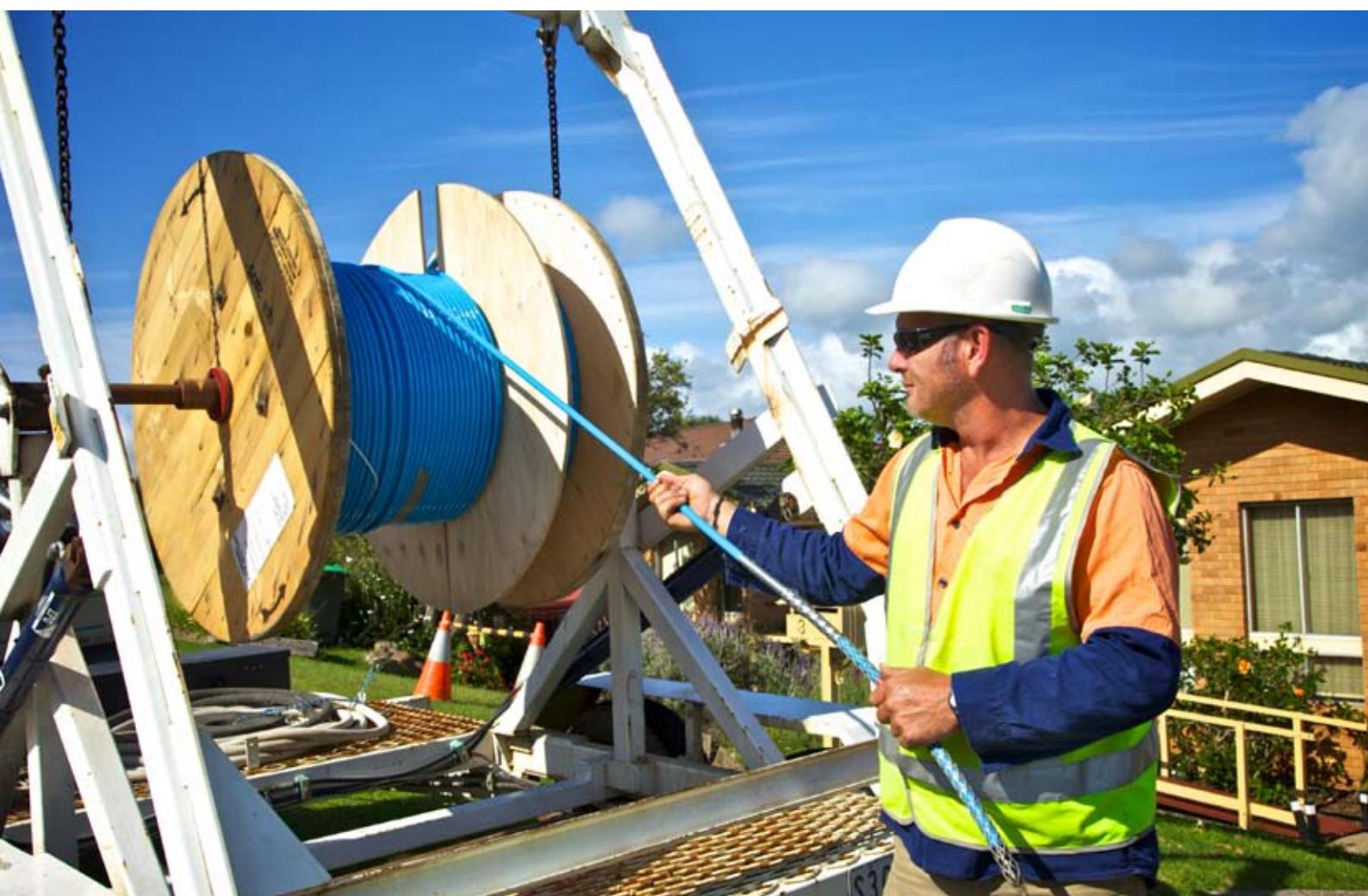
There can be little doubt that telecommunications infrastructure is one of the most important roads of the 21st century. Distance is a part of Australian folklore, both the distance from one part of the country to another and the distance from Australia to other countries. Australians should have a continuing love for telecommunications and attach a special importance to ensuring there's widespread access to its benefits.

When the NBN project began Australia's telecommunications needed a radical intervention with the impatience of Alexander's solution to the Gordian Knot. The accretions of business and regulation had produced a sclerotic system that was resistant to change and that had created incentives for many to defend the status quo. The creation of NBN Co and beginning the flow of investment capital was essential to breaking that impasse.

We can be similarly confident that wireless mobile broadband, the capacity to unplug but still have a broadband connection, is an immensely significant technological development. In a relatively short time, it has had far-reaching consequences that transform the way we do things, disrupt and reorganise industries and make a real difference to people's lives. Its effects are likely to continue to grow.

Mobile access is already a factor that defines the range of opportunities someone has: what they can learn, how and who from; who they can work with, or collaborate in production; what services they can access; what decisions they can be part of; where and how well they can find customers; and what actions they can take – whether involving financial transactions or opening and closing gates.

Australia needed a breakthrough in telecommunications and the investment in the NBN achieved that. It is very fortunate that the infrastructure being built can be adapted quickly to the continued developments of technology, and in particular to the growth in the potential value to be gained from mobile broadband. What Australia needs now is to make sure that the benefits of its investment to productivity and equity are maximised. A large part of achieving that will be to make sure it contributes to the widespread deployment of mobile broadband.





Appendix

TIMELINE OF EVENTS.

2003

22 January 2003

Broadband Advisory Group the Howard government's Broadband Advisory Group (BAG) recommended the Federal Government work with other governments and industry stakeholders to form a "national broadband network. Subsequent proposals failed due rejection by ACCC and other issues.

2007

In the run-up to the Federal election, opposition Labor party leaders announced a Labor Government would build a "super-fast" national broadband network, if elected.

The network was estimated to cost A\$15 billion including a government contribution of A\$4.7 billion which would be raised in part by selling the Federal Government's remaining shares in Telstra. After the election, the new Labor Rudd Government issued a request for proposals (RFP) to build the NBN, and six proposals were submitted but the RFP was terminated on 7 April 2009.

2009

April 2009

After terminating its initial RFP, the Rudd Government announced it would bypass the existing copper network by constructing a new national network combining fibre to the premises (FTTP), fixed wireless and satellite technologies.

Tasmania was selected for a trial deployment based on the Tasmanian Government's submission to the RFP.

At the same time, the federal government threatened to force a structural separation of Telstra.

7 April 2009 Gov't announces termination of RFP process on advice from 'Expert Panel' "...that none of the national proposals offered value for money."

http://www.dbcde.gov.au/broadband/national_broadband_network

Gov't reveals plans for a new NBN project:

- Wholesale open-access network.
- FTTP to 90% of premises with D/L speed of 100mbps
- Wireless/satellite services to 10% with D/L speeds of 12mbps or more.
- Cost up to \$43b funded by a Public/Private partnership.
- Govt funding through the Building Australia Fund and the issuance of Aussie Infrastructure Bonds (AIBs)
- Maximum private interest of 49%
- Govt intending to sell down its interest 5 years after completion dependent on conditions.
- 8 years build time

Govt announces FTTP network to commence rollout in Tas as early as July 2009 by Tas Govt and state owned Aurora Energy.

Regulatory Reform paper released for discussion. Submissions close 3 June 2009.

NBN Co was established on 9 April 2009.

2011 ▶

December 2009

Nextgen Networks awarded contract to build backhaul under the \$250 million Regional Backbone Blackspots Program. Nextgen Networks to operate and maintain the backhaul links for 5 years.

March 2011

Parliament passed the *National Broadband Network Companies Act 2011*. The amendments centred around transparency, freedom of information and competition concerns, including the adoption of uniform national wholesale prices for NBN connections.

ACCC confirms final list of Points of Interconnect.

National Broadband Network Companies Bill 2010 and National Broadband.

May 2011

First mainland retail customers on the NBN ‘officially’ connected in Armidale, NSW.

NBN Co commences second round of public consultation on wholesale arrangements.

June 2011

NBN Co and Telstra announce definitive agreement on access to infrastructure, transfer of customers, Universal Service Obligation, financial payments, and other issues relating to the NBN. Agreement to be put to Telstra shareholders at AGM on 18th October 2011 when it would then become binding.

NBN Co and Optus announce definitive agreement for the transfer of Optus’ HFC broadband customers to the NBN.

Govt announces the making of five key regulatory instruments dealing with the structural separation of Telstra.

July 2011

Govt announces commercial launch of the Interim Satellite Service as part of the NBN.

2011 ▶

September 2011

First Queensland trials of the NBN commence in Townsville.

First connections of NBN in a new housing estate made live in Sydney NSW.

Senate passes Telecommunications Legislation Amendment (Fibre Deployment) Bill 2011.

October 2011

NBN Co enables sign-ups by customers on a commercial basis.

Contract for the provision of 10 POIs awarded to Emerson Network Power. Contract value approx \$100m.

Telstra shareholders approve plan to progressively decommission its copper-based network and allow NBN Co to access its pits, manholes and exchanges, and sell some infrastructure, receiving in return \$11bn from the federal government.

November 2011

NBN Co releases Wholesale Broadband Agreement (WBA) Version 5.

December 2011

NBN Co lodges Special Access Undertaking with the ACCC

Telstra submits revised structural separation undertaking with AC2012.

2012 ➤

February 2012

Dominant incumbent Telstra releases first commercial plans for services on the NBN.

ACCC approves Telstra's structural separation agreement.

March 2012

Definitive Agreements signed between Telstra, the Government and NBN Co for compensation to Telstra for use of its 'pit and pipe' infrastructure and transfer of customers to NBN.

NBN Co releases 3 year network rollout plan covering 3.5 million premises nationally.

November 2012

ACCC publishes Listed Points of Interconnection for NBN.

ACCC releases first discussion paper on NBN Co SAU.

December 2012

NBN Co announces Moonyoonooka, WA as site for a Satellite ground station.

NBN Co submits revised revised SAU to the ACCC.

2013

February 2013

ACCC issues Discussion Paper on Points of Interconnect on issues of 'POI usage', 'extent of competition at the listed POIs' among other issues.

Joint Select Committee on the NBN recommends exploring how NBN can improve mobile services.

April 2013

ACCC rejects NBN Co Special Access Undertaking and issues consultation paper.

NBN Co announces launch of a 1 Gigabit wholesale broadband service by December 2013.

Coalition launch broadband policy.

August 2013

NBN releases product specification paper for backhaul/transmission.



Footnotes

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