



Broadbanding Brunswick

High-speed Broadband and Household Media Ecologies:
A Report on Household Take-up and Adoption of the National
Broadband Network in a First Release Site



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Executive Summary

Background

This study of the household adoption of the National Broadband Network (NBN) in the first-release site of Brunswick, Victoria, examined the take-up, use and implications of high-speed broadband for some of its earliest adopters. The study aims to make a contribution to ongoing national and international understanding of the domestic deployment of next-generation broadband and its contexts of use as these technologies become available.

This research examines whether the adoption and appropriation of high-speed broadband (HSB) by households in Brunswick impacts the domestic media and communications environment, influences household consumption patterns and costs of communication technologies, and shapes the social and economic participation of households in the digital economy.

Methods

The study used mixed methods and a longitudinal approach, surveying and interviewing households in Brunswick in 2011 and 2012. The research was informed by a 'media ecology' approach, in which high-speed broadband was examined as part of the domestic technological environment as a whole, rather than focusing on discrete technologies or applications.

Findings

One: early adopters

Research results show that there is a relationship between NBN uptake and household composition, ownership, and income. First adopters of the NBN are much more likely to be households with children than those without children, are more likely to have higher incomes than those with ADSL, and are much more likely to be households who own their home rather than rent.

Two: varied uptake

The slower rate of initial take-up in Brunswick relative to other early release sites was explained by three factors. Firstly, Brunswick residents were amongst the first to confront a new set of decisions, dealing with often unfamiliar broadband technology, and an installation process that was still in an early stage of development. In particular, confusion about the NBN Co. as a wholesale infrastructure provider was widespread. Secondly, landlords (not residents) needed to provide approval for installation. Thirdly, this was compounded by the demographic profile, socioeconomic status, and cultural composition of Brunswick residents. The longitudinal data did however reveal an increase in household adoption of the NBN, suggesting many of these earlier installation issues and delays had been worked through.

Three: decision making

Decision making in household uptake of the NBN appeared to be guided by an active rather than passive response to the communications marketplace. That is, early adopters actively sought HSB.

NBN households were more likely to be guided by Internet speed in their decision-making, whereas non-NBN connected households emphasised the importance of price. Despite this difference, the perception of Internet service value was a significant factor in decision-making across all household connection types.

For NBN connected households the value proposition related to personal benefits in terms of data volume and speed, as well as broader community and economic benefits such as productivity and inclusion.

Our respondents provided four main reasons for *not* adopting the NBN. These reasons were: (1) not knowing what the NBN is, and that it was available; (2) perceived costs; (3) factors relating to installation processes, and; (4) thinking their current household Internet connection suited their needs.

For non-NBN connected households, the value proposition of their current Internet service was based on perceived cost, satisfaction with ADSL performance, or satisfaction with their current bundled plan.

At this early point in the NBN rollout it would seem that ISPs are not yet a change-agent motivating NBN uptake.

Four: speed

This research showed that households have a good understanding of their ISP data allowance and are aware – often acutely – of their monthly limits, but are much less knowledgeable about data speeds – either achieved or advertised. Internet speed among all types of broadband users is often understood in intuitive or experiential ways rather than quantitatively, however, NBN users tend to be more knowledgeable about quantifiable measures.

Five: cost

Perceived costs of NBN use follows a normal curve, with most NBN users indicating no change in costs and decreasing numbers indicating increased or decreased costs.

Six: usage:

NBN connected homes are more likely to make greater use of the Internet, and are more likely to engage in more sophisticated online activities, but the association is not necessarily causal. NBN connected households are almost twice as likely to be used as places of work than other households.

Seven: household ecology

The NBN is contributing to ongoing shifts in household media ecologies and practices, in which device accumulation and Internet access is moving from singular, wired and fixed to multiple, wireless and mobile. Whilst NBN homes have shifted to a more convergent communications ecology, this trend differs from other fixed-line broadband households that tend to continue to maintain complementary communication services, and from wireless broadband households that tend towards substitution for mobile devices.

Eight: the big picture

Our research suggests that the personal value proposition of the NBN is its speed and its data capacity, which is perceived to be associated with increased participation in the digital economy for both work and leisure. NBN households also believe the NBN is of national value and can help to play an important role in building the productivity and competitiveness of the national economy, and in providing for universal digital inclusion.

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Background and Context

The National Broadband Network

The National Broadband Network (NBN) is the largest public infrastructure project in Australia's history. It will deliver high-speed broadband to all Australians using a combination of fibre-optic cable, wireless and satellite technologies. The installation model of the NBN is premised upon the capacity and benefits afforded by replacing the copper telecommunications network with a network of fibre-optic cable, which is rolled out to the front door of homes. This fibre-to-the-premise (FTTP) model will apply to roughly 93% of the population and will deliver Internet speeds of up to 100 megabits per second (Mbps) – rising to 1 gigabit per second (Gbps). For the 7% of Australians who live in remote rural areas or in towns of less than 1000 households, wireless and satellite connections will deliver speeds of at least 12 Mbps. Together, these technologies will provide a common platform of universal and ubiquitous broadband, to be installed and operated by NBN Co. Limited, a company set up by the Federal Government in 2009, and to be divested within 5 years of the network's completion.

NBN Co. will operate the network on a wholesale basis, selling a tiered range of broadband products to retail service providers, who in turn will offer products to consumers in the telecommunications marketplace. As a wholesale provider NBN Co. does not get involved in contractual arrangements between consumers and Internet service providers (ISPs) for the provision of actual Internet services over the NBN. Connecting to the NBN does not oblige householders to connect to a fibre Internet service and currently has no impact on existing phone line or Internet services, though in time the existing copper network will be decommissioned.

The NBN was announced on April 7, 2009, by the Minister for Broadband, Communications and the Digital Economy (DBCDE), Stephen Conroy, who stated:

Every person and business in Australia, no-matter where they are located, will have access to affordable, high-speed broadband at their fingertips. High speed broadband is increasingly essential to the way Australians communicate, and do business. It will help drive Australia's productivity, improve education and health service delivery and connect our big cities and regional centres (Conroy, 2009).

As a publicly funded and national scheme to deliver high-speed broadband, the significance of the NBN for economic prosperity and the importance of the NBN for social inclusion are premised upon connecting all Australians. Anticipated productivity gains associated with the broadband capacity and data transfer speeds of the NBN clearly rely upon delivery and take-up by private industry and public institutions. Yet, without infrastructure delivered and adopted by households the full potential of high-speed broadband for Australia's digital economy and inclusion will not be realised.

The Australian Communications and Consumer Action network (ACCAN) recognises this potential of the NBN to provide universal and equitable access to high-speed broadband, yet alongside this they point out that the NBN is a technical infrastructure operated on a wholesale business model, and so any social benefits also depend upon consumer adoption of broadband products and consumer experiences of broadband services:

When all Australians have access to the NBN, it can begin to serve as the platform for the delivery of a range of government services, such as health and education, as well as a platform for new services. The NBN can serve every home and business in Australia, not just a lucky few in big cities. The NBN will be an open platform for all service providers to use, so it will stimulate fair competition that hopefully will benefit consumers (ACCAN, 2011).

The consumer experience of broadband service quality and broadband product options are, then, a combination of the physical network installed, managed and wholesaled by NBN Co., as well as the retail communication products packaged and offered by Internet service providers (ISPs).

Thus, the ambition to digitally connect and include all Australians does not just depend upon access to ‘fast broadband’ through the provision of fibre to homes but, critically, upon how this technology is perceived, adopted and experienced by householders. The household and consumer adoption of the NBN will be affected by a range of factors, including: the experience of the installation process, how the technology is understood, the perceived benefits of high-speed broadband, the quality of the Internet service delivered by retail service providers, the costs and affordability of broadband Internet service plans, how households use or anticipate using Internet applications, and how broadband fits with – and affects – the existing household communications environment.

The consumer experience of high-speed broadband is in this sense an experience of a changing *media ecology*, not simply an experience of high-speed-broadband. The rollout of the NBN and the possibilities afforded by high-speed-broadband are contextualised in terms of its place in the increasingly busy arrangements of electronic media and communications devices, providers, services and applications in the home.

The domestic appropriation of the NBN will undoubtedly have implications for the routines, practices and meanings of home life, just as the telephone, television, and computing technologies have in the past (e.g. Lally, 2002; Marvin 1988; Spigel, 1992). Yet, the take-up of high-speed broadband does not operate in isolation, but in these existing and wider contexts of current communications technology use, as well as anticipated futures of Internet applications. Investigating this moment in the history of broadband developments is critical if scholars, policy makers and industries are to understand the emerging, evolving and shifting economic and cultural implications of communications infrastructure, services and uses.

This study contributes to this understanding by investigating the appropriation of high-speed broadband in home environments by some of its earliest adopters. Our study used mixed-methods and a longitudinal approach, to report on how appropriation of high-speed broadband:

- influences family consumption patterns and costs of media and communication,
- impacts upon the domestic media and communications environment,
- shapes the social and economic participation of households in the digital economy, and
- changes over time as high-speed-broadband is habituated.

This research responds to the ongoing need to assess the implications of changing media and communications technologies for Australian families. The importance of assessing the impacts of media and communications services for consumers is, however, heightened by the rapid changes currently underway in the sector, and in particular the looming widespread rollout of high-speed broadband across Australia. The take-up and use of broadband in the home thus forms a key site for mapping the present and possible future of innovation in broadband technology, and its social and economic impacts.

The project builds on the authors’ history of research into the changing dynamics of information and communication technologies for Australian family life (e.g. Arnold 2004; Arnold *et al* 2006; Nansen *et al* 2009, 2010, 2011; Shepherd *et al* 2007); and it extends our recent pilot study of NBN adoption in Tasmania using a grant from the Institute for a

Broadband Enabled Society (Apperley *et al* 2011; Wilken *et al* 2011). This specific project will assist broadband consumers by developing our understanding of the impacts of the NBN and high-speed broadband on consumption behaviours and trends within Australian households.

NBN Construction in Brunswick

Construction of the NBN began in Tasmania and continued with five first-release sites on mainland Australia in 2010. In early 2012 the NBN Co. finalised a deal with Telstra to access the former national telecommunications service provider's nationwide infrastructure of cables, ducts, and equipment on telephone exchanges. At this point NBN Co. announced a ramping up of the rollout, which is expected to cost around AUD \$43 billion, pass 3.5 million premises by mid-2015, reach up to 6,000 premises per day at the rollout's peak, with completion expected in 2021 (NBN Co, 2011).

Connecting households to the NBN involves the installation of optical fibre cables (either underground or overhead) from the street to a premises connection device (PCD) fixed on the outside of the building, and then drilled through a wall to connect the fibre cable from the PCD to an internal Network Termination Device (NTD). NBN Co. has stated that they will seek to place the NTD in an internal location preferred by the owner, as long as that is consistent with NBN Co.'s safety and other requirements and regulations (NBN Co., 2011)

Brunswick was selected as one of the five mainland first release sites. First release sites were selected test and bed-down a number of physical and consumer design and installation factors in different geographic locations prior to the network rolling out nationally. These factors included terrain, housing type and density, demographics, climate, and existing infrastructure. Brunswick was regarded as a representative location for testing design and construction techniques in an inner suburban area, where much older communications infrastructure must be negotiated (NBN Co., 2010a).

The area covered by the Brunswick trial rollout is bordered by Sydney Rd, Lygon St, Glenlyon Rd and Stewart St, and provided broadband access to approximately 2,600 premises. The rollout took place in three stages: installation of the fibre optic cable through the streets; connecting the fibre optic cable to the outside of private properties; and, finally installing the internal equipment and activating a retail plan with an Internet service provider (ISP) on the fibre network. Preparation for the rollout in Brunswick began in 2010, and work laying cable and connecting homes proceeded through 2011, with retail services from ISPs slowly made available to households in late 2011 and early 2012.

As a first-release site, the Brunswick rollout was predominantly a technical trial of installation processes and protocols, yet it has also been interpreted more broadly in the media as a trial of demand for, and thus expected success of, the NBN itself. At that time, owner permission for installation was required, and it was reported that initial consent for connection across the five first release sites was around 70% (Battersby, 2010; Grubb, 2010). However, there has been a wide variation in take-up rates between these sites. In Armidale, NSW, and Willunga, SA, the percentage of property owners consenting to fibre connections is between 80%-90%, whereas in Brunswick, Victoria, and Midway Point, Tasmania, where our research has been undertaken, the take-up rate is closer to 50% (Battersby, 2010; Gregg and Wilson, 2011; Grubb, 2010).

Brunswick has a large population of migrants from southern Europe – who settled after World War II. More recently, migrants from Eastern Europe, Africa, Asia and the Middle East have settled here. This culturally and linguistically diverse (CALD) community is, however, changing as young professionals and families gradually replace post-war migrant households, due to proximity to the Melbourne CBD and ease of access to employment, education and other amenities.

Today, Brunswick is populated by a higher proportion of residents born overseas (38.9%) and residents from non-English speaking backgrounds (36.4%) compared with the Victorian average (ABS, 2012). Brunswick also has a

significantly larger proportion of group or shared households (14.2%) compared to family households, and a larger proportion of residents who rent their homes (46.3%) compared to home owners than the Victorian average – 4.2% and 26.5% respectively (ABS, 2012). The cultural and linguistic diversity, as well as the ownership rates and composition types of households in Brunswick, may have had an impact upon people’s ability to engage with the NBN rollout processes.

Pre-NBN household Internet access, use and literacy, however, would appear to be less of a barrier to NBN adoption within Brunswick, which maps closely onto the Victorian averages for rates of household Internet access and rates of household broadband connectivity. 79% of Victorian households have Internet access and 91% of these connections via broadband; 81.8% of Brunswick households have Internet access and 90.4% of these connections via broadband (ABS, 2012).

NBN Pricing

NBN Co. will provide a uniform national wholesale pricing model based upon a tiered product range offering different levels of data upload and download transfer speeds. The NBN is an open-access network and wholesale pricing to retail service providers (or what they call ‘access seekers’) are then packaged into various retail products for on-sale to households. The entry-level NBN wholesale product of 12 Mbps download speed and 1 Mbps upload speed will be the minimum standard across all broadband technologies – fibre, wireless, and satellite (NBN Co, 2010b).

NBN wholesale plans:

Download speed (Mbps)	Upload speed (Mbps)	Wholesale price per month
12	1	\$24
25	5	\$27
25	10	\$30
50	20	\$34
100	40	\$38

Table 1: NBN wholesale plans

The various NBN retail Internet plans offered by retail service providers will be based upon this wholesale price, but vary according to market decisions made by each provider. These packages will offer various combinations of data speed (in line with the tiers above) and data allowance (download per month). A number of ISPs already offer NBN plans, and this market will continue to grow as the rollout reaches more people. There are a number of websites, forums, and blogs that attempt to clarify the impact of NBN pricing for consumers. Some of this material focuses on indirect cost implications for consumers through the opportunities and challenges presented by the architecture of the infrastructure, the wholesale business model, and the relationship between ISPs and the NBN. There is also material addressing the direct costs of NBN plans to consumers, with some sites providing a list of NBN retail plans available (e.g. Computerworld Australia); some sites comparing the price and quality of NBN and ADSL2+ plans offered by ISPs (e.g. Whistleout); and also some sites where consumers themselves are sharing, comparing and discussing their broadband plans (e.g. Whirlpool).

These various sites reveal the complexity that exists in the telecommunications and Internet market, with consumers having to negotiate and make a decision between a number of service providers, a range of different broadband

data speed and data allowance combinations – including what kind of connection type – and different kinds of packaged products. Such packages may be just Internet, or they may be Internet bundled with other service products, including landline or fixed-line telephone, an Internet phone service, mobile phones, pay-TV, or with other online services such as video on demand entertainment. This complexity is, obviously, compounded by the introduction of a new kind of broadband technology and business model.

This variability and complexity means it is difficult to make general comparisons between the costs to consumers of NBN plans and other broadband Internet plans, especially as NBN offerings are relatively new and will continue to change as new retail providers emerge. Nevertheless, the aggregator and comparison sites suggest that: the cost of NBN plans are competitive with many ADSL2+ plans; NBN pricing is often more expensive for low usage plans, but cheaper for high usage plans; NBN plan pricing is often cheaper when comparing per monthly GB of data (monthly cost/monthly data allowance), and faster when comparing data speeds available Mbps. An important distinction made between the different broadband infrastructures is that ADSL plans, which use copper phone lines, often have line rental costs charged by ISPs, whereas NBN plans use fibre which does not incur a line rental fee.

Literature review

Connected homes

The implementation of the NBN is a nationally significant investment, and the fibre-to-the-premises (FTTP) model of the NBN means that household adoption, expectation and use of high-speed broadband will be crucial for the success of the NBN, and the growth of the digital economy (Apperley *et al* 2011; Wilken *et al* 2011). Apart from the financial viability of the network depending upon high rates of household take-up, the broader ambition of the network for connectivity, inclusion and productivity (Conroy, 2009) depends upon how this technology is appropriated by householders. The home will be a critical site for fibre-enabled services for education, work, entertainment, health and communication.

Most of today's household Internet uses and applications can be delivered using broadband on the copper infrastructure, yet future delivery of commercial, health, education and government services is expected to demand bandwidth that requires a high-speed broadband network. Using fibre-optic cables will improve the speed, quality and reliability of broadband services available to Australians and make possible as yet unanticipated applications:

New services that can only work on the NBN platform are likely to emerge once the rollout has progressed sufficiently. For early users of the NBN, it is likely to be the ability to use multiple known online applications simultaneously that will be most attractive feature. Experience with other technologies suggests that it is only when a critical mass of users, or potential users is reached, that new high-speed/high capacity services will be deployed or developed (DBCDE 2011).

Whilst many fibre-enabled Internet futures remain unknown, initially next-generation broadband will facilitate video streaming applications, high-quality videoconferencing, faster and larger file transfers – both uploads and downloads, and will allow a number of high-bandwidth applications to run simultaneously (Access economics, 2010). It is anticipated that such applications will improve communication services and “help drive Australia's productivity” (Conroy, 2009), providing a platform for Australia to increasingly move into the knowledge economy (Tucker, 2010).

The DBCDE (2011) note in their Submission to the House Standing Committee on Infrastructure and Communications on the Role and Potential of the National Broadband Network that the benefits to the consumer of digital engagement include:

- enhanced communication through email, instant messaging, VoIP and other services;

- time saving activities including telecommuting, online shopping, remote work and study opportunities, information gathering and accessing services;
- price/product discovery;
- education and knowledge;
- access to new online services such as social networking, media/entertainment and professional services;
- substitution of physical services to services delivered electronically; and
- engagement in the online community

Accompanying these anticipated benefits are a range of expectations about the ways that broadband infrastructure will impact on the use and understanding of homes, with a range of projected benefits across social, economic and environmental spheres. These include better opportunities for flexible management of work-life balance, expanded possibilities for home-based production and access to education and health, overcoming geographic barriers and the tyranny of distance for economic participation and productivity in regional areas, and reduced commuting and the associated impacts on congestion, fuel consumption and carbon emissions on the environment (Access Economics, 2010; DBCDE, 2011; Gregg and Wilson, 2011).

Many of these impacts are premised on a shift in the functionality and architecture of houses in parallel with the installation of broadband infrastructure, which will transition the home into a smart digital space. Ideas about smart, connected or digital homes have been around in different guises for a number of decades, variously constructing the home as a platform that combines hardware and software to produce an environment of interoperable consumer electronics or automatic devices, based on networks of shared protocols and standards (e.g., Allon, 2001; Trulove, 2003; Venkatesh, 2008). Yet the rollout of the NBN and delivery of fibre-to-the-premises is a shift from thinking about the digital home simply in terms of consumer electronics and interoperable or automatic devices, to addressing the home as a platform for both consumption and production embedded within the digital economy (Apperley *et al* 2011).

Nevertheless, to transform home life the NBN infrastructure needs a whole range of ancillary or complementary devices and applications to emerge and converge within the digital household, including the domestic network of hardware devices, internal connections, software, and of course the competency and interest of householders.

Participation in the digital economy

In the Australian context the digital economy is defined by the Australian Communications and Media Authority (ACMA) as “capture[ing] the changes that are resulting from the availability and access to high-speed fixed and wireless broadband networks, together with the use of ICTs to undertake everyday economic and social activities” (ACMA, 2009: 11). It is widely accepted that broadband Internet access is an essential requirement to participate in the digital economy: “Households with only dial-up or no Internet service are increasingly being left behind in the information age. Increasingly fast Internet access is required for accessing essential information and undertaking domestic and non-domestic business as both government and the private sector are increasingly conducting their business, or aspects of it, on-line” (Moreland City Council). Key trends that support the growth of the digital economy and greater usage of digital media and communication technologies by Australian families for both work and leisure include the declining cost of telecommunication hardware and services (ACMA, 2007); emerging mobile Internet access platforms and the increased functionality of Internet-enabled (smart) mobile phones (ACMA, 2009); increased speeds of service provision (ABS, 2012); and increased use of social media and online transactions (Sensis, 2009).

Nevertheless, the technical dimensions of provision and access to communication infrastructures, devices or services are by themselves not enough to secure inclusion in the digital economy (e.g. Maher, 2008; Warschauer, 2003). Warschauer (2003), for example, has noted that access and inclusion requires a range of interconnected resources: physical (hardware/device); digital (connection); human (literacy); and social (social networks). As such, the concerns

around access, which were traditionally grounded in debates around a 'digital divide' and the presence or absence of an Internet connection, have shifted to consider questions about a 'participation gap'. Here, participation encompasses a range of technical, economic and social resources, from speed and cost of services to forms of knowledge and expertise required to successfully understand and use technologies.

Effective participation implies that the NBN's project to provide fibre-optic cable infrastructure to the front door of every home is by itself not enough. How high-speed broadband is imagined, adopted, appropriated, domesticated and folded into routine by families and households who vary widely in their digital literacy will be critical to its success, and critical to people's experience of the digital economy. New technologies often face a problem in being understood and used. Of course, the NBN is not alone in this. People commonly feel that technology is unreasonable and irrational in its demands despite the efforts of interface designers and software engineers to create 'user-friendly' products. Short life cycles, quick turn-over and high redundancy rates would appear to be a digital industry standard. Compounding the problem of technologies that are illegible in themselves, then, is the challenges and solutions to questions of technology-convergence, accumulation, placement, displacement, interoperability, and obsolescence.

Household media ecologies

Australian homes are continually evolving technology environments. The trend towards an accumulation of devices, screens and access in Australian homes is, for example, well documented by the Australian Communications and Media Authority, and by the Australian Bureau of Statistics. It is not uncommon for Australian family homes to have multiple, televisions, computers, and mobile phones (ACMA, 2007), whilst 79% of households have Internet access, with 92% these connections via broadband (DSL/ADSL; Cable; Mobile/Wireless) (ABS, 2012). Consequently, ACMA describe this household media ecology as technology rich or ubiquitous. Contemporary homes, then, are media saturated environments, and as sites of continual technological change the study of domestic appropriation of high-speed broadband requires an approach that examines the domestic technological environment as a whole, or the media 'ecology' of technologies and practices, not just a study of high-speed broadband in isolation (e.g., Shepherd *et al* 2007; Wilken *et al* 2011).

The conceptual model of a media and communications ecology – of which some of the present authors have been instrumental in developing in relation to household environments (Shepherd *et al* 2007) – is useful for situating more limited models of diffusion in relation to the physical and digital environments in which technology use and mediation takes place. The ecological metaphor shifts the focus away from studies focusing on discrete, individual devices or applications, to encompass systems of media and communications interaction.

Radically faster connectivity available through high-speed broadband will undoubtedly have a significant impact on this ecology; on the household's experience with and use of media and communications. A conceptual framework and methods that take account of the mutual relationships between technologies and users, and situate new technology innovations in relation to existing systems is needed to take an integrated, comparative and historical approach to the manner in which high-speed broadband mediates, amends and reconfigures the domestic media and communications 'ecology' (Hearn and Foth 2007; Shepherd *et al* 2007; Tacchi, 2006).

This approach has emerged from and been influential in studies of media histories and successive waves of technical innovation adopted into home life, including family television viewing (Spigel, 1992), home-based computer adoption (Lally, 2002), media rich 'bedroom culture' and multiple screen households (Livingstone 2009), shifts in wireless devices and living (Nansen *et al* 2009, 2011), and the 'domestication of elsewhere' through personalised electronic media (Wilken, 2011). This approach also extends a rich tradition of media homes research, and empirical approaches that trace how the uses and experiences of innovations in technologies within the home are adopted and accommodated into routines and environments (e.g. Silverstone and Hirsch 1992; Spigel 1992, 2001). Theories of 'domestication' (e.g. Silverstone and Hirsch 1992), for example, develop a more integrated perspective that is not

limited to individual people or products, but also accounts for the situated and dynamic processes of technology appropriation in the context of family life.

Using a communicative ecologies theoretical framework enables new innovations and their appropriation to be considered in the contexts of the aggregated home technology environment; to analyse how this ecology changes in response to the adoption of high-speed broadband in the home; and how practices change in response to the reconfigured domestic media and communications ecology. Thus, not only does the successful integration of the NBN with the digital home rely upon take-up of technical infrastructures and networks, but to fully realise ambitions for digital inclusion and the digital economy it also depends upon the aggregation and interaction of the household media ecology, including its technologies, costs, uses and literacies.

Our earlier NBN adoption research (Apperley *et al* 2011; Wilken *et al* 2011) suggests that initial stuttering problems of NBN adoption involve a number of factors, including a lack of understanding or literacy about the infrastructure and rollout, confusing installation logistics and processes such as the opt-in policy, difficulties or delays with ISPs offering or connecting a service, and uncertainty in decision-making within a complex retail and technological environment (Apperley *et al*, 2011; Wilken *et al* 2011). The implications of this research for broadband delivery and for research on high-speed broadband are that fibre networks cannot be reduced to a network of technologies, but are instead part of a much more heterogeneous network of actors that include legislation and policies, landlords and estate agents, ISP contracts and bundling practices, household budgets and literacies, modems and routers, and so on.

Communications research

The present work builds upon other Australian Internet research programs, such as The Internet in Australia project (Ewing and Thomas, 2012), and the Australian Communications and Media Authority's research program¹. This research shows that Internet access and use is growing, yet unlike the television and telephone the Internet is still not a universal communications medium, with access and quality of use varying across different populations and demographics. The current project complements these broader research projects by investigating the specific conditions of NBN adoption, and the impacts of high-speed broadband on the ecology of home technologies and practices. This project explores consumer issues for take-up and appropriation of the NBN within the wider communications landscape.

Research shows that not only is household Internet adoption in Australia increasing, but so is the take-up or transition to faster Internet services: home Internet connections have risen from 20% to 80% since 1998; whilst the substitution of dial-up services for broadband Internet at home has steadily increased since 2004 (ABS, 2012; ACMA, 2008)². Yet, whilst household rates of Internet adoption and take-up of faster Internet services have steadily increased in Australia, many homes remain un-connected (Ewing and Thomas, 2012).

Some critical issues in relation to adoption and non-adoption of high-speed broadband relate to consumer attitudes towards and uses of communications services in the contexts of convergence where increased choices of communication platforms and devices also imply possibilities for or demand decisions with substituting or complementing communication options. Here, consumers need to choose between increased complexity of Internet

¹ The Telecommunication Today research reports series; the Australia in the Digital Economy report series; and the Convergence and Communications report series.

² There is no consensus regarding what constitutes a broadband connection. E.g.: "Broadband means a high-speed, 'always on', communications link that carries information between one location and another" (ACCAN, 2011); "For the purposes of this report broadband is defined as any connection that is not dial-up" (Ewing and Thomas, 2010); "In this report, broadband refers to an 'always on' Internet connection with an access data rate equal to or greater than 256 kbit/s—the data rate used by the Organisation for Economic Cooperation and Development (OECD) to describe broadband. For consistency, high-speed and non-dial-up are also referred to as broadband." (ACMA, 2008).

connection types (e.g. ADSL, fibre, mobile or wireless broadband), voice communication platforms (mobile, fixed-line, Internet telephony); and the arrangements of substitution or complementarity between them.

ACMA (2010) research shows that while over 90% of Australians continue to use both fixed-line phones and mobile phones for voice communications, seeing them as complementary services, many Australians are increasing substituting fixed-line phones for mobiles. Substitution of a fixed-line phone for a mobile service is becoming more common in Australia, as is the rising popularity of voice communications over the Internet – Voice over Internet Protocol (VoIP) (ACCAN, 2010).³ Ewing and Thomas (2012) have found that there is an increase in the use of the Internet to make and receive telephone calls, with 17% of Internet users using this type of VoIP service in 2007 and 39% in 2011. The potential of the VoIP market has been recognised by industry, with 47 per cent of Internet service providers offering VoIP services as part of a bundled broadband package (ACMA, 2010).

An important part of this equation for consumers is pricing and cost of household communication services. ACMA's (2007) *Telecommunications Today: Consumer Take-up and Use of Communication Services*, found that the majority (84%) of people were able to state their monthly Internet expenditure, with 67% of dial-up users stating it was under \$30 a month and 56% of broadband users stating it was between \$30 and \$70 a month. Yet as noted in the approach of this study, household communication services need to be considered in aggregation, not in isolation, as they operate in relation to each other. So just as use of technologies work in arrangements of complementarity and substitution, so too do pricing arrangements and decisions. For example, the expense of mobile phone calls are considered in relation to the cost of maintaining a fixed-line voice service and line rental fee, and Internet connection costs are considered in relation to data speed and allowance.

Methods

To better understand the evolving dynamics of early adoption and appropriation of high-speed broadband in domestic environments, the study used mixed methods and a longitudinal approach. The value of a mixed methods approach is that it combines the strengths of qualitative techniques for providing greater depth and explanatory insight with the strengths of quantitative techniques for identifying broad trends and patterns. In addition, the longitudinal approach allowed us to compare changes over time.

We recruited households in the Brunswick early release site, including homes with an NBN connection and those without. There were 2600 homes contained within the Brunswick rollout. The study initially surveyed 282 households (baseline) in late 2011; conducted follow-up qualitative interviews with a smaller sample of 20 households in mid-2012; and conducted a follow-up survey in late 2012 with a subset of 102 households from the initial survey respondents.

All 2600 households in the Brunswick NBN release site were approached by door-to-door canvassing; with the surveys administered face-to-face by researchers. The face-to-face survey administration helped to eliminate the sample bias of other forms of surveying such as telephone or email that exclude respondents who do not own a landline telephone or computer – a particularly relevant methodological concern for a study of media and communications ecologies in the home. The selection of the qualitative sample was informed by the quantitative analysis, based on a purposive sample of various household Internet connection types. The purposive sample of qualitative participants contextualised the patterns and trends identified in the survey data with an in-depth understanding of some motivations and experiences of adoption.

³ VoIP encodes voice communications into Internet protocol (IP) data packets for transmission over IP networks such as the Internet, as opposed to analogue signals sent over copper telephone wire.

The **surveys** gathered data on:

- household demographics;
- costs and patterns of Internet and communication technology adoption;
- media and communications devices and placement within the home;
- use of media and communications services;
- decision-making and satisfaction with communication services used; and
- views on the NBN

The **qualitative research** was based on interviews in participant homes, which were semi-structured around themes of broadband adoption, impacts and views, and questions designed to explore in greater detail the meaning, motivations and practices of technology appropriation and decision-making. The longitudinal dimension of the study allowed us to look at the dynamics of change, and to reveal shifting patterns of technology consumption and use.

The surveys gathered discrete data, which was measured on nominal and ordinal scales, and then analysed using descriptive and bivariate statistical techniques to identify and compare relationships between the different variables of household broadband adoption. The successive wave of survey data collection was analysed to compare changes over time. The qualitative data was analysed using inductive thematic data analysis techniques to compare themes of adoption, by providing households with an opportunity to explain their experiences and their decisions in detail.

Findings and Discussion

Household Internet connections

Of the initial 282 household respondents to the 2011 survey, 57 (20%) did not have any household Internet access. This proportion is similar to the latest ABS figures from the 2011 census on household Internet access (2012). Respondents without home Internet were not included in further data collection or analysis within our study. Whilst it is important to study the reasons for non Internet use at home, especially in relation to issues of participation in the digital economy, this is outside the scope of the present study which is focused on adoption or transition to high-speed broadband (see ACMA, 2009; Ewing and Thomas, 2012, for analysis of non-users). Anecdotally from our research fieldwork, respondents who did not have home Internet were predominantly older and non-English speakers.

What is the principal type of Internet connection in your house?

Of the 225 household respondents who had home Internet access in the 2011 survey, 57% had a fixed-line broadband connection (DSL/ADSL, cable), 18% had a mobile or wireless broadband connection, and 20% had an NBN connection (see Figure 1).⁴ Of the 80% of homes who did not yet have an NBN Internet service, 27% of these had the external equipment installed on their property, and half of these said they were in the process of organising an NBN service.

By the time of the 2012 survey, the number of households that had an NBN Internet connection had climbed to 36%, whilst the number that had an ADSL (or similar) connection had dropped to 34% (see Figure 2). This data suggests that over the course of the 10 months between the 2011 and 2012 surveys there was a significant shift in the number of households substituting ADSL broadband for NBN broadband. When asked in the second survey if they

⁴ For the purposes of this report household Internet types are broken into three categories: ADSL (which includes all fixed-line broadband Internet that isn't fibre, such as DSL, ADSL2+ and cable); Wireless (which includes all types of mobile wireless broadband Internet); and NBN (which refers to broadband Internet using fibre on the National Broadband Network). Whilst households may have multiple types of Internet access, they are categorised according to their principal or primary type.

had changed their household Internet connection type since the previous survey, 1 in 5 respondents reported shifting from ADSL to NBN plans during that time.

This data shows that of those with home Internet access in the Brunswick rollout area, 96% have some kind of broadband connection. This data is consistent with evidence from previous Australian household Internet research, which shows that not only is household Internet adoption in Australia increasing, but so is the take-up or transition to available faster Internet services. As Ewing and Thomas (2012) note, this pattern of household adoption of Internet access and faster Internet speeds shows that home Internet is becoming increasingly integral to Australians' lives – we have now reached the point where dial-up access is a marginal form of access; we would say almost historical. Overwhelmingly, our respondents agreed that having home Internet access is important, with 95% indicating it is important or very important.

Household Internet connection (2011)

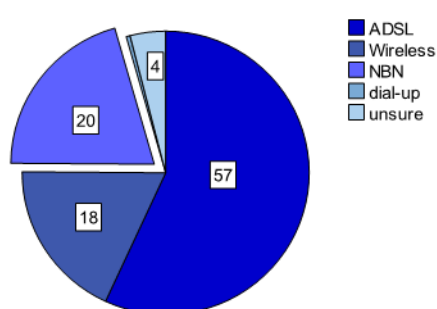


Figure 1: Household connection type in 2011

Household Internet connection (2012)

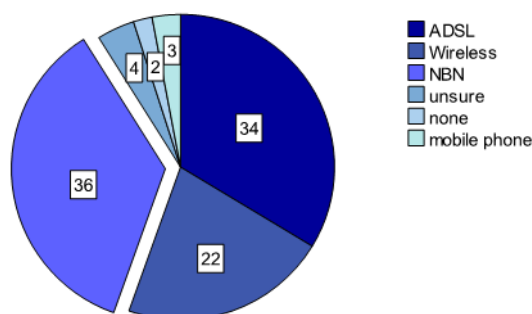


Figure 2: Household connection type in 2012

NBN adoption

The limited number and scale of early release sites make it difficult to generalise about NBN take-up rates. Nevertheless, research in these areas offers an opportunity to investigate early experiences of the NBN and high-speed broadband, which may have relevance for households and consumers more broadly. Variation in rates of uptake would appear to be a consequence of three factors.

Firstly, whilst residents within the Brunswick site were among the first potential beneficiaries of the NBN, they were also amongst the first to have to navigate a new national communications infrastructure scheme, an often unfamiliar broadband technology, and an installation process that was still in an early stage of development.

Secondly, the installation process in early release locations required owners of properties agree to become connected—as opposed to being automatically connected unless they opt-out. To 'opt-in', home owners, not necessarily household residents, needed to sign a written consent form granting access rights to their property. This requirement may have presented difficulties for a number of residents, including renters who needed to obtain consent from their landlords, and those with poor English literacy who needed to be able to read consent forms. Thirdly, those without a sophisticated understanding of network provision were unable to understand what the NBN infrastructure and broadband connections meant. In particular there was confusion about the NBN's role as an infrastructure provider – a wholesaler of high-speed-broadband capacity - as opposed to a retailer of broadband services.

These issues may have had particular relevance for the demographics, socioeconomic status and cultural composition of Brunswick residents.

NBN adoption and household composition

Comparisons between the Internet connection type and the relationship or composition of household inhabitants show that households that take-up the NBN are much more likely to be families with children (59%), than couples, shared or single households (see Figure 3).

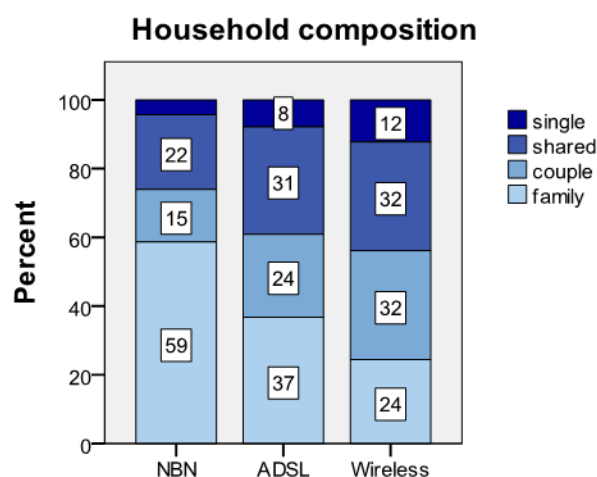


Figure 3: Comparison between Internet connection type and household composition

Comparisons between the Internet connection type and home ownership show that households that take up the NBN are much more likely to own their home (63%), whereas households that use wireless broadband to access the Internet at home are much more likely to rent (see Figure 4).

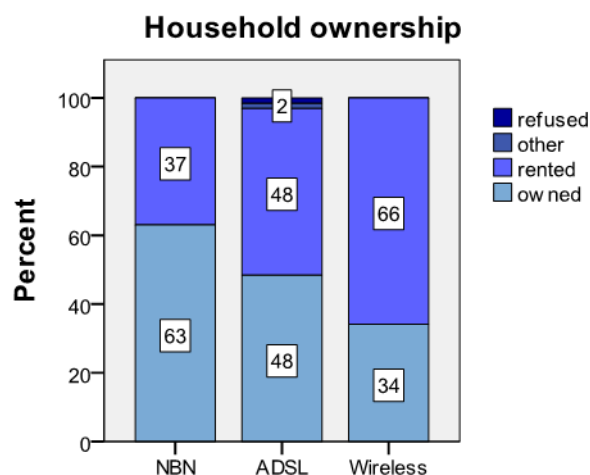


Figure 4: Comparison between Internet connection type and household ownership

NBN adoption and household income

Comparisons between the Internet connection type and household income show that households that take-up the NBN tend to earn more money than those who have ADSL broadband connections, with 52% of NBN adopters having

an annual household income greater than \$100,000 per annum, compared to 33% of ADSL and 39% of wireless connected households (see Figure 5).

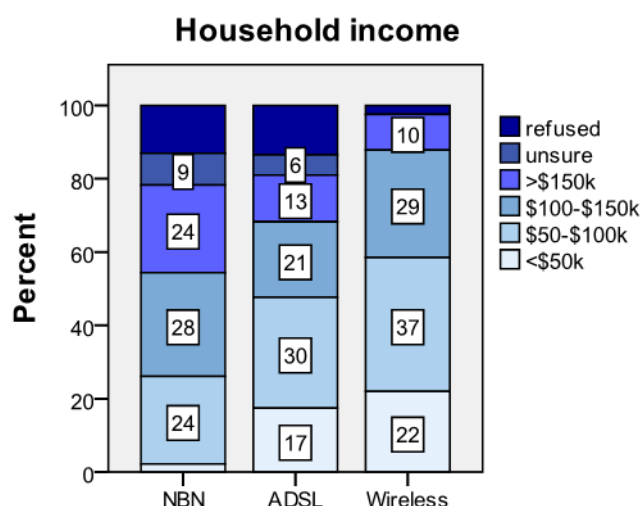


Figure 5: Comparison between Internet connection type and household income

The survey data suggests that there is a relationship between NBN adoption and household composition, ownership and income, with households adopting the NBN much more likely to be families with children who own their own home and earn over \$100,000 per annum.

Reasons for NBN adoption

What is the main reason you have this type of Internet connection?

Reasons given for the type of household Internet connection were more varied amongst non-NBN connected homes; with NBN connected homes giving fewer reasons. Considerations related to Internet speed emerged as the most common amongst all households. Nevertheless, considerations of speed were not simply about a desire for faster speed, but also a feeling that current home Internet speeds were sufficient for home Internet usage. This difference mapped onto type of home Internet connection, with 44% of NBN homes saying that they wanted fast speed, whilst only 2% of non-NBN connected homes gave this as a reason. In contrast, 27% of non-NBN homes said their current speed was fast enough and suited their needs (see Figure 6).

Other reasons given also differed according to the type of household Internet connection. For NBN-connected homes, other significant reasons related to an ISP offer (19%) and trialling the NBN (25%). Whereas, for non-NBN connected homes, a large proportion of households were unable to give a specific reason (22%) (see Figure 6).

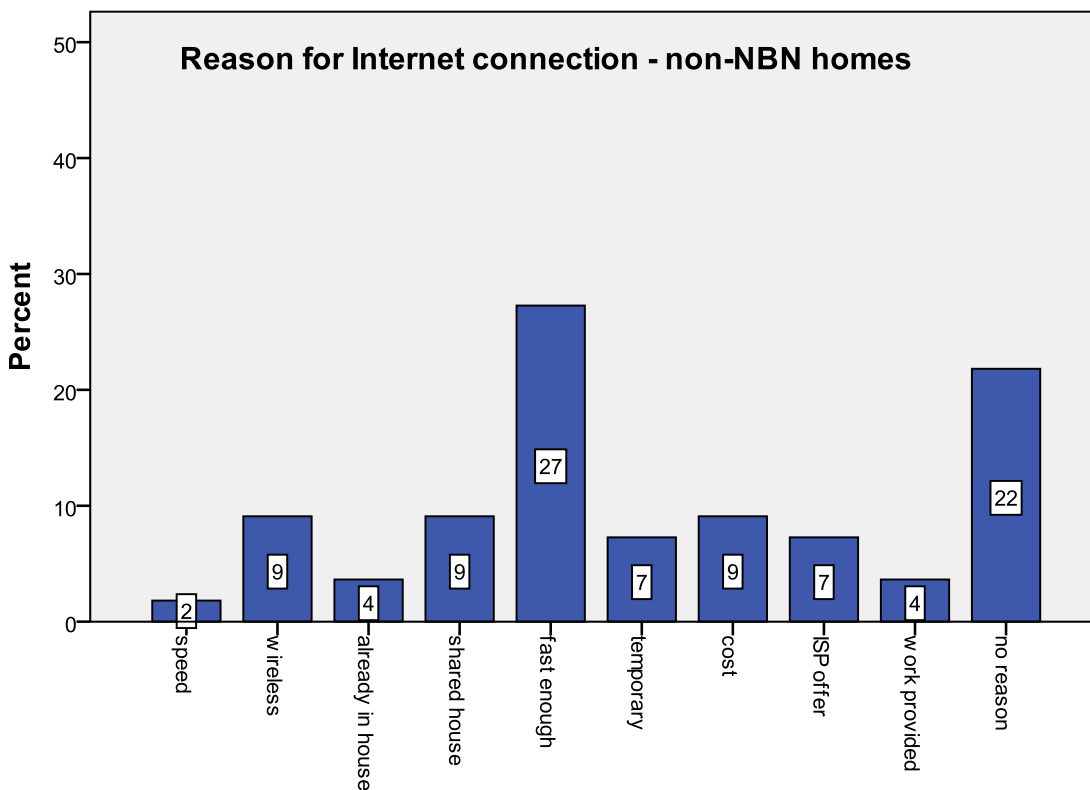
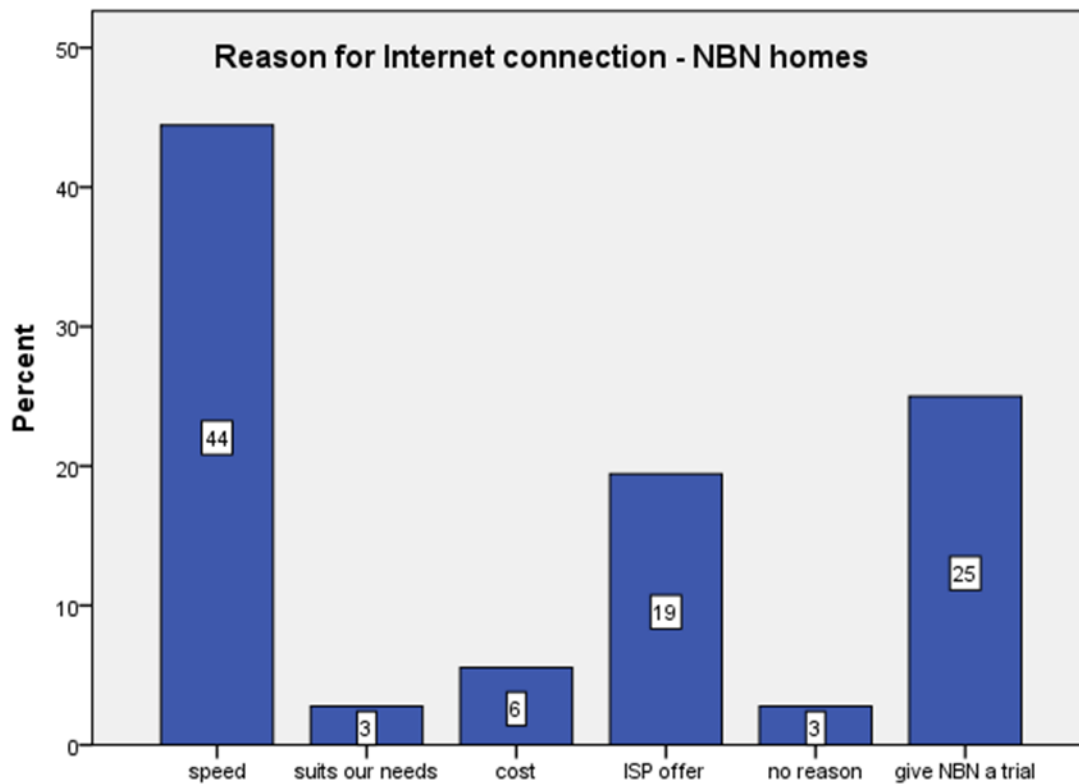


Figure 6: Comparison between NBN and non-NBN connected homes reason for Internet connection type

Comparing specific household Internet connection types, wireless broadband households were much more likely to be motivated by issues related to mobility in shared house situations, and in a transition or moving period. NBN households were much more likely to be motivated by reasons to do with Internet connection speed, or willingness to experiment and trial a new technology. Finally, ADSL homes were much more likely to be guided less by directed or explicit reasons than a kind of inertia where they could give no real reason for having that type of Internet connection, or a sense that what they currently had worked well enough for their needs. So, these households seem to be guided less by active decision-making and more by a passive sort of response to the communications marketplace.

The qualitative data on reasons for type of Internet connection helps explain some of the differences between households in the kind of Internet connection they choose to adopt. These differences between NBN, ADSL and wireless households relate to Internet usage and functionality and the kind of connection that is seen to afford the most benefits, suitability or flexibility for their lifestyle (again there is a distinct difference between active and passive choices):

NBN subscriber:

"We just switched over to NBN, before that we had ADSL...we just want speed you know, we only use it for browsing, we don't download movies or anything major, but we just want it to be fast because we are just impatient."

"I think the faster Internet the better, just in terms of less frustrating; you get information quicker and easier and enables you to get on with what you are doing."

ADSL subscriber: *"The only reason I don't swing onto it (NBN) is I'm used to what we've got and if it's not busted why fix it..."*

"I don't know if I can see any benefits with high-speed broadband to be honest. I see when you sit at the computer you want information about one thing and information about 20 other things comes up the side, I just get sick of it. And I can just imagine there'd be more of that."

"It's fine for us. We use it just for a bit of gaming, standard emails and surfing, a bit of video and stuff like that. But it's pretty standard fare."

Wireless subscriber: *"My wife and I have wireless broadband, we each have one, on different accounts...it offers us flexibility because we just moved house..."*

"We are not connected to either a landline or Internet, I actually tether to my mobile phone data plan. I found that has been the most cost effective for my needs."

What was the motivation to change your household Internet connection?

Of the 20% of respondents in the 2012 survey who had changed their household Internet connection type since the 2011 survey, 29% said for greater Internet speed, 24% said for better quality Internet service, and 12% said because of their increased Internet usage. These reasons were almost all given by households that had upgraded from ADSL to NBN services (see Figure 7).

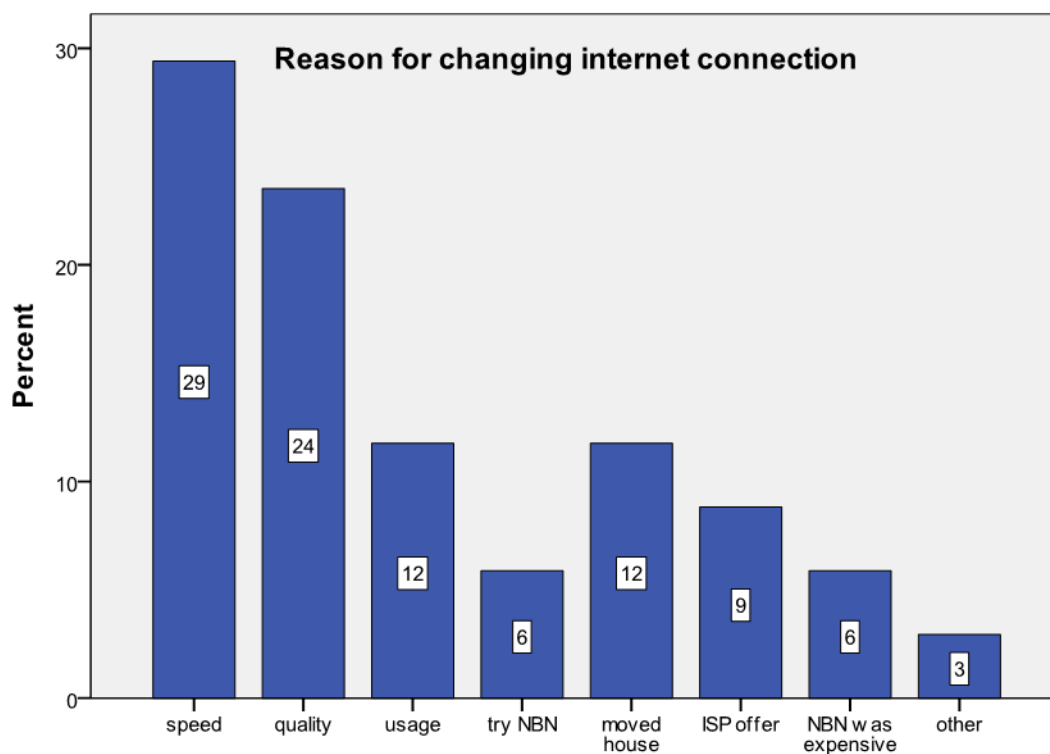


Figure 7: Reason for changing Internet connection in past year (2011-2012)

What is the main reason you are not connected to the NBN?

For those households not connected to the NBN in 2011, a significant proportion did not know what the NBN is, or did not know that it was available (a combined 17%). This suggests the NBN Co. still has work to do in lifting its profile among end-users. A further 17% of respondents stating that they thought moving to the NBN would be too expensive. Related to perceived cost was usage, with 11% of households stating that they didn't see the need to upgrade as their current household Internet connection type (speed and plan) worked for their needs (see Figure 8).

The next major factor in lack of NBN adoption in 2011 related to installation processes and procedures. 13% of respondents had the NBN equipment installed but not activated with a service yet, 15% were in the process of organising a service with an ISP, and 5% were unable to get an NBN service with their ISP because they were either locked into a contract or their provider did not offer NBN plans (see Figure 8). A further 6% said they had not been contacted by the NBN.

So whilst not connected in 2011 many were considering or in the process of getting connected but delayed for a number of reasons, including: waiting for the technician to come and connect equipment or service, waiting for their current ISP to release NBN pricing plans, or waiting for their current Internet contract to expire. These issues were sometimes exacerbated by the installation arrangements involving multiple contractors, parties or companies that consumers needed to engage, including signing a consent form from NBN Co, organising arrangements with subcontractors to install external and internal NBN equipment, and negotiating with an ISP to establish a retail plan and connect to the NBN equipment.

Factors related to installation policies and procedures impacted particularly on renters, with 8% of households stating in 2011 that their landlord had not signed the opt-in form. The proportion of Brunswick residents in rental housing is larger than the Victorian average, and the opt-in policy requiring property owners consent for connection made it a more complex task for renters contributing to the lower take-up rates.

Reasons for non-adoption

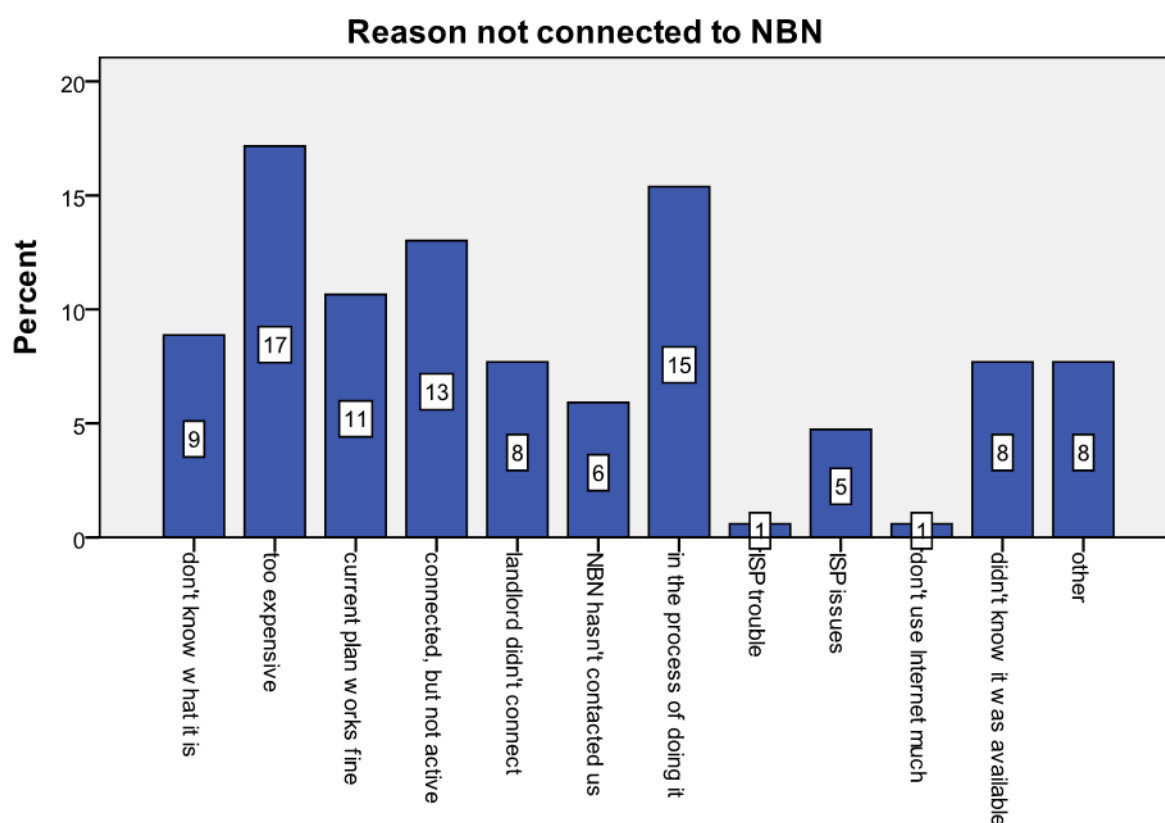


Figure 8: Reason not connected to the NBN in 2011

Qualitative data on people's understanding of NBN prices and their Internet needs explains why many households have not taken-up an NBN service:

Perceived price: *"We got heaps of stuff for NBN – sign up for this mob or that mob, they all sent it out, but looking at the prices nah. At the moment it's costing about \$100 a month, and that includes the Internet, the phone, everything, which would be more (on NBN)."*

"It was free to hook it up to the house, that's as far as I've got...but the plan prices, at the moment I pay nearly \$40 a month and they wanted to double that, and I don't need all that data."

Tiered pricing: *"It's the service providers and cost. I just can't understand why we have been give something so fast and then said we'll give it to you this slow and you have to pay for that speed."*

Perceived need: *"We spend \$79 per month...the NBN box is connected but it is just sitting there and I'll wait and see, it just depends but at the moment we don't have a need for it. I've got 200 gigs at the moment and the speeds good..."*

Qualitative data on people's experience of the NBN rollout and getting connected explains some of these challenges and reasons for inability or delays in connecting to the NBN:

Consent form: *"it (NBN Co letter) was just a mail box drop, so a lot of people didn't get involved, I'm an avid junk mail reader, but a lot of people would have just thrown it out."*

Rollout: *"The rollout was an interesting experience in that there were many arms to the implementation and none of them seemed to cohere at all. So people came first and did the business outside and said someone would come*

sometime, and we had a lot of trouble with the modem. But there's been no problems since. The hardware was in two phases and that was fine. But it was a kind of desultory experience, you never really knew what was happening, it took place over a long period of time, I couldn't really quantify it. 9 months, something like that."

Installation: "I was amazed at how long they took to install it at my house. I had the broadband at my wall; they only had to pierce the wall and mount the box on that side and then the modem and test it, and that took 2 men 3 hours. Now one guy was waiting for the other guy, but still that's 6 hours, and at \$100 an hour, that's \$600..and then they gave me a back-up device in case the power goes out, I said 'I don't need it'. If the power goes out it goes out; I'm more worried about my fridge if the power goes out. There was kind of a bit of overkill."

ISP problems: "I've had a couple of notices saying if you want to come on with us, but I've rung TPG and it doesn't look like they're going to provide it."

Renters: "I haven't looked into getting the new high-speed broadband only because we are renting and I thought opening that can of worms with my landlord would be a little bit difficult."

"... a lot of people rent here, so unless their landlord filled it in they wouldn't know."

The longitudinal data from the 2012 survey, in which the proportion of households that had an NBN Internet connection climbed from 20% to 36%, suggests that many of these earlier installation issues and delays had been worked through.

Satisfaction with Internet connection

How satisfied are you with your current Internet connection?

Recent evidence (Ewing and Thomas, 2012) shows that reliability does not appear to be an issue for the majority of Australians with an Internet connection at home (30% very satisfied; 43% moderately satisfied). In contrast to reliability, speed does appear to be an issue. They found that one in five Australians are unhappy with the speed of their Internet connection. Ewing and Thomas suggest this represents a significant underlying demand for the NBN.

Our research appears to confirm this finding. Satisfaction with Internet reliability suggests that regardless of type of home broadband people are overwhelmingly satisfied or very satisfied (see Figure 9). Comparing satisfaction levels with Internet speed across household Internet type shows, however, that whilst people are overwhelmingly satisfied with their speed regardless of type of home broadband, those with an NBN connection are more likely to be very satisfied (58%) with their speed than those with an ADSL (35%) or wireless connection (41%) (see Figure 10).

Satisfaction with Internet reliability

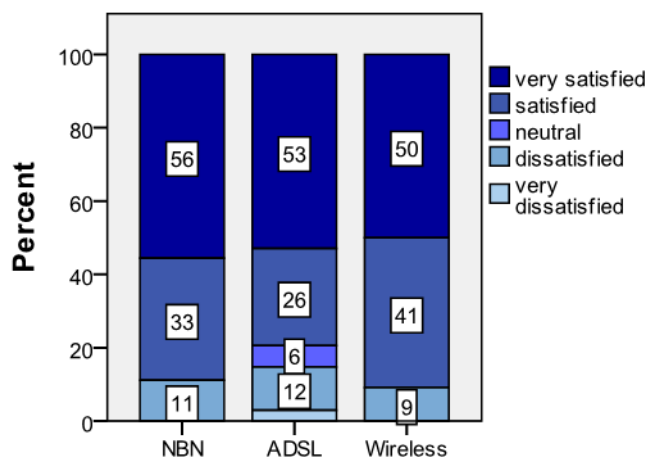


Figure 9: Comparison between Internet type and satisfaction with reliability of Internet

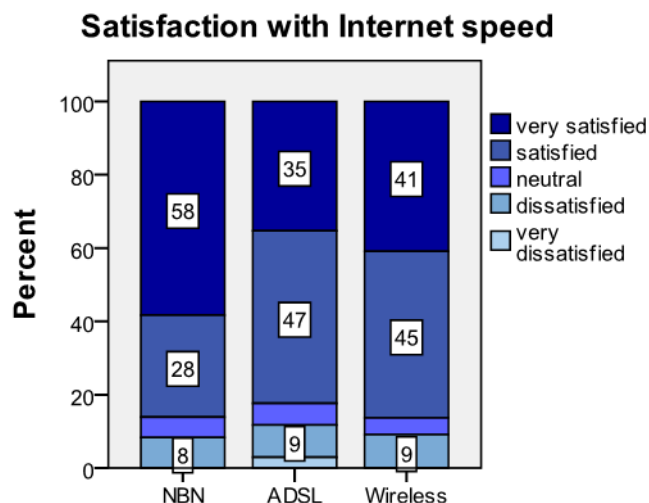


Figure 10: Comparison between Internet type and satisfaction with speed of Internet

Internet service provision

Who is your Internet Service Provider (ISP)?

When asked who provided their retail Internet service plan – their ISP – our data shows a wide spread of household providers, but also that a limited number of providers have market dominance – Optus (25%), Telstra (20%), iiNet (19%) and to a lesser extent TPG (10%) and Internode (5%).

When we compare ISP providers by type of household Internet connection the data shows there is difference in dominance of providers in relation to type of Internet provision – for ADSL the spread is fairly even between the main providers, whilst iiNet and Telstra are more popular amongst NBN subscribers, and Optus is more popular amongst wireless subscribers (see Figure 11).

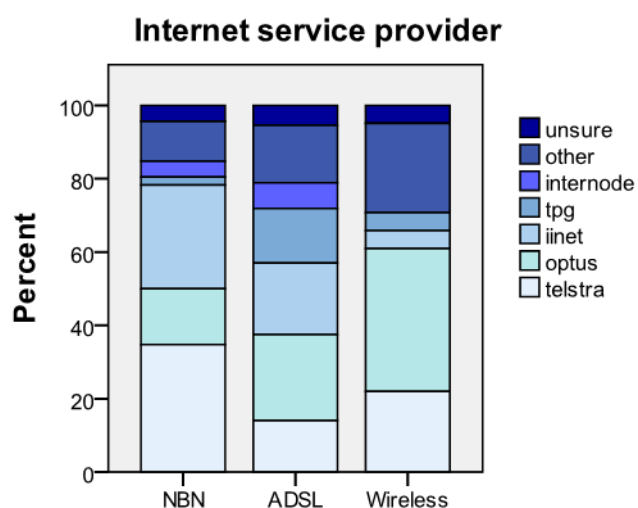


Figure 11: Comparison between Internet type and Internet service provider

Such differences may be associated with different ISPs targeting particular Internet market groups or packaging more competitive product offerings for specific types of Internet provision. Conversely, such differences may relate to consumer perceptions of service quality or value for the kind of household Internet sought. In addition, however, we found in our qualitative research that there was a kind of inertia or passive quality to people's relationships with, or choice, of ISP. This inertia was associated with the "hassle" involved in changing providers, especially if the quality or price of service was seen to be satisfactory:

"I have no idea if we are choosing the best value for money option, but it's the inertia you've got with Telstra, so it would be a fandango to change to Optus or iiNet."

"I went from ADSL to broadband with Optus simply because I already had an account and didn't have to fill-out an application and credit check and all that."

"I enquired last week to check on speed and plans, just with iiNet, I didn't go any further afield because I'm happy with the service, and I couldn't be bothered changing everything around because then you have to get new modems and all that sort of stuff..."

This inertia was reflected in the findings on household's duration of Internet provision by their current ISP, which did not reflect a normal distribution curve but an inverted bell curve distributed away from the mean, with households more likely to either stick with the same ISP for a long duration (6+ years), or change ISP more frequently (<1 year) (see Figure 12). This pattern of consumer duration with ISP suggests a bifurcation of groups between more active and more passive decision-making in choosing an ISP.

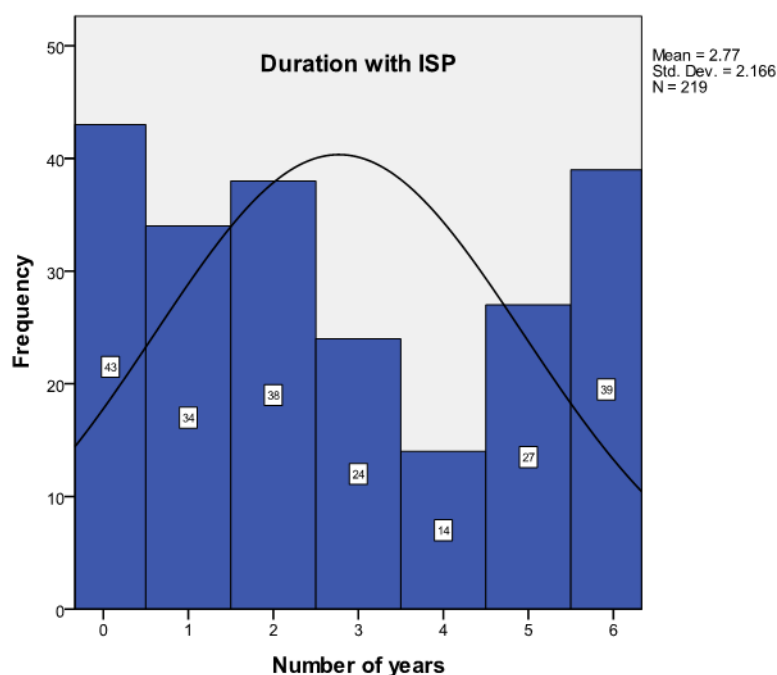


Figure 12: Household duration (in years) with current Internet service provider

What is the main reason you have this Internet service plan?

Reasons given for the type of household Internet connection varied, though considerations related to perceptions of value (26%), cost (21%) and speed (14%) were the most common. Other reasons included the fact it was a bundled plan (9%) and Internet usage levels (6%) (see Figure 13).

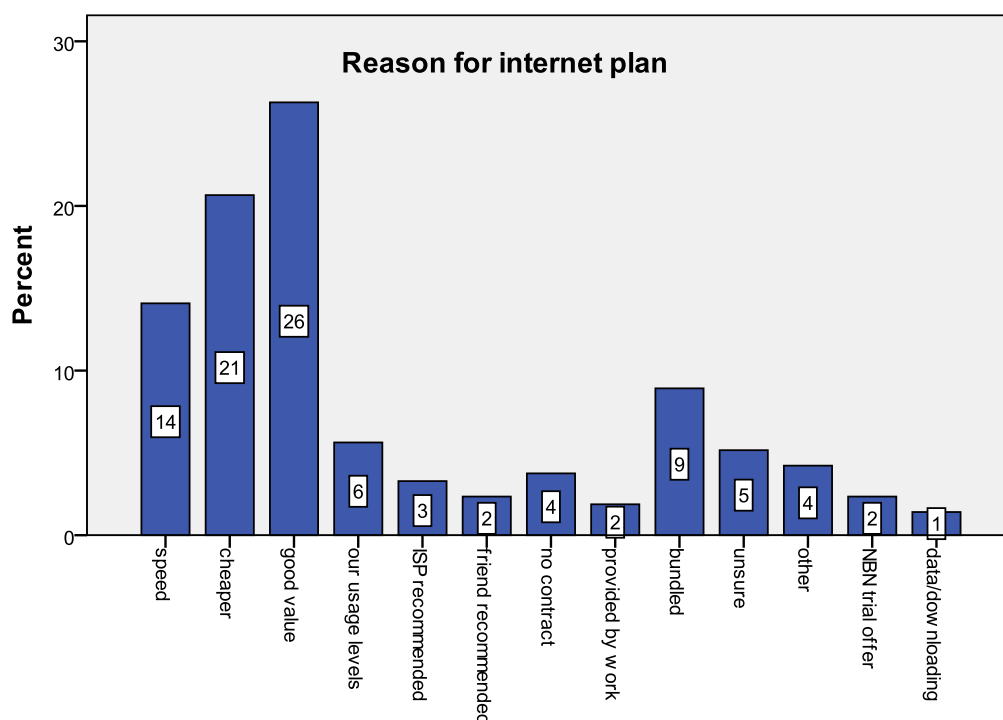


Figure 13: Households' reasons for choice of Internet service plan

Consistent with reasons for choosing type of Internet connection, the reasons that households chose an Internet service plan differed in comparisons between NBN and non-NBN connected households. The affordability of plans was a more important reason for non-NBN households (24%) than NBN-connected households (9%), whereas speed was more important to NBN-connected homes (29%) than non-NBN homes (10%).

Whilst comparison of household Internet type showed a divergence in decision-making between NBN and non-NBN connected households in relation to cost and speed, there was also a convergence in relation to perceived value. All households with broadband plans expressed value as an important reason for choosing their current plan, with 24% NBN households and 29% of non-NBN households nominating value as the main reason.

Whilst cost simply equates directly with the price paid, value is a much more subjective phenomenon about the relationship between the price paid and the benefits, utility or quality an individual perceives in a commodity or service. Comparisons of cost are much more straightforward, whereas decisions about value are more subjective and complicated by a range of factors. In the current climate these may be associated with public debates and discussions about the broader value of the NBN, or a more personal 'value proposition' in the equation of cost versus Internet quality.

The qualitative data helped to explain why value was expressed as an important reason for choosing an Internet plan regardless of type of household broadband type, by unpacking some of the differing sentiments and understandings of value.

Value for non-NBN subscribers: For non-NBN connected households the value proposition of their current Internet service was based on factors such as the perception an NBN plan would be more expensive, their Internet usage didn't justify increased expense, the speed of their current Internet connection was sufficient for their usage, or they currently had a bundled plan (data, voice) that they felt could not be matched if they switched to the NBN:

"All the (ISP) offers we are getting are base amounts around what we were paying and then they are going to charge you around \$20 a month extra according to what speed, and that seems absolutely ridiculous. Here we have access and the whole idea of the NBN is the speed and they're going 'no, we will just give you ordinary speed' which is probably no faster than ADSL or you'll pay..."

"The drawbacks are it is probably going to cost more, and we won't utilise the capacity. I probably have enough computing power on my computer to design the space shuttle and I use it 90% of the time as a word processing machine. And the speed of the Internet I could probably do something extraordinary but I won't use it..."

"Unless there was some sort of video on demand service or something like that which would require that kind of speed; maybe for business, but not for home use?"

Husband: "It'd be faster that's all. It's just faster, that's the only thing."

Wife: "Why do you need something that's faster?"

"You should be able to make phone calls on the Internet. There was not option of a voice over Internet phone; none of the bundles they have are offering it."

Value for NBN subscribers: For NBN connected households the value proposition of an NBN plan related to factors such as a sense of the broader or future benefits of the NBN, increased Internet usage levels, greater bandwidth in terms of data volume and speed, and the discovery that plans on the NBN were often comparable or cheaper, often by substituting landline for VoIP telephony as part of the transition:

"I think the benefit is there in the long run, it's like building a highway...people might use it to save time and I guarantee if you build it that highway will be busy in 10 years. I look at the NBN in the same category."

"I figure why would you say no, you know. It's my home, so why not, I'm just adding value as far as I see."

"The speed is significantly faster, flipping around the Internet, flipping from page to page it's fast, you don't get the buffering say when you go into a video, it would buffer before, you'd sit there and wait, you don't get that anymore. It's more enjoyable when it's fast, and we'll pay a bit extra"

"Our usage has gone up over the last 5 years, more social media, books, accessing information you wouldn't otherwise be able to, all the banking, the whole lot, and skypeing, broad modes of communication, and different kinds all the time."

"It's a lot faster and the price is the same and my download usage is more. So I'm pretty happy."

"I'm now spending a lot less, with the deal I've got currently. It has several components, it has the phone as well, not mobile, and Internet. I've gone from about \$150 a month – except for the mobile phone – to about \$90. I've kept the landline. It was a very good deal they offered me."

"I get a landline VoIP phone included, that plugs into the modem or whatever. And I get \$30 free calls a month and my cost went from \$59.95 a month to \$62.95, so 3 dollars."

In the 2012 survey we asked households who had an NBN service if they thought Internet service plans available on the NBN were good value. 50% either agreed or strongly agreed that they were good value (see Figure 14).

Are NBN plans good value?

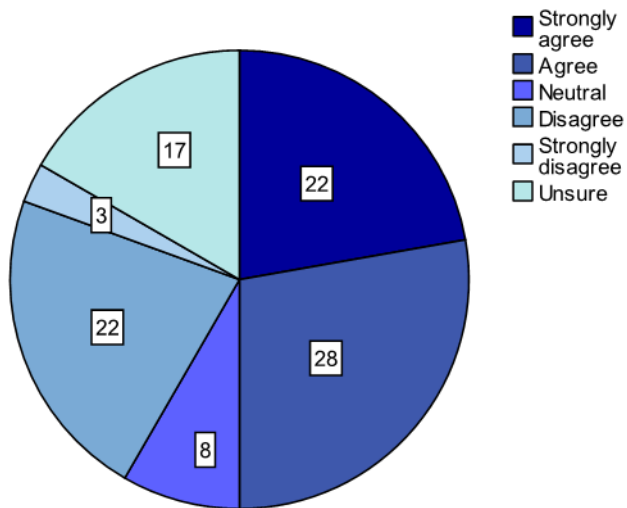


Figure 14: NBN households view of service plan value

Broadband literacy

This research shows that households have a good understanding and are aware – often acutely – of their monthly ISP data allowance, but are much less knowledgeable about the data speed possible or advertised as part of their service plan. When respondents were asked about their maximum available Internet data allowance per month – the limit on the volume or amount of data users can upload and download in a month before their Internet access is shaped (data transmission rate slowed) or billed extra for each unit of data – over two thirds were able to state the volume of data allowance in their Internet service plan (see Figure 15). In contrast, when asked about their maximum Internet bandwidth or data transmission speed – the highest rate of download and upload data speed provided by their Internet service – two-thirds of respondents were unsure (see Figure 16).

What is your maximum data allowance per month?

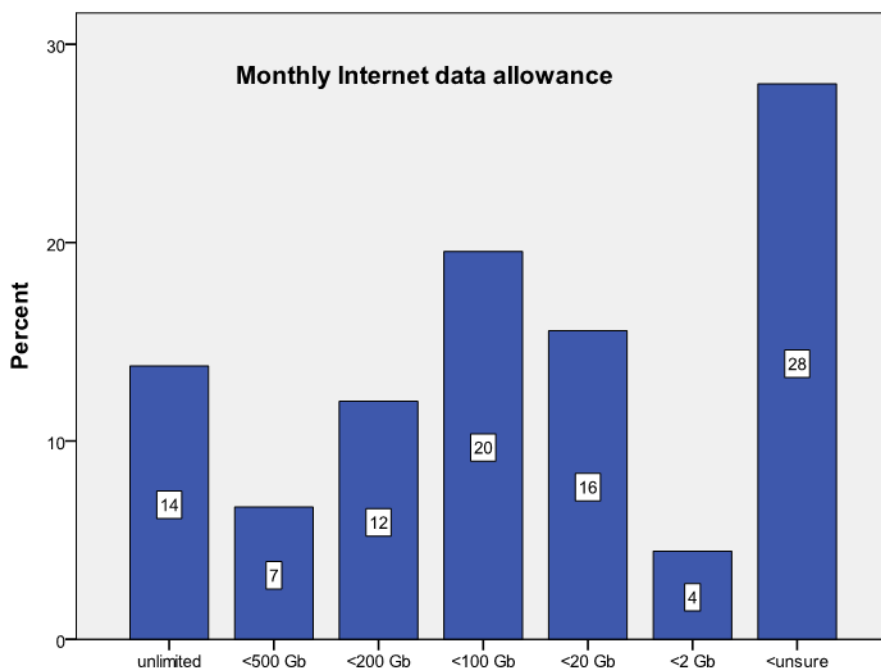


Figure 15: Household understanding of Internet data allowance per month

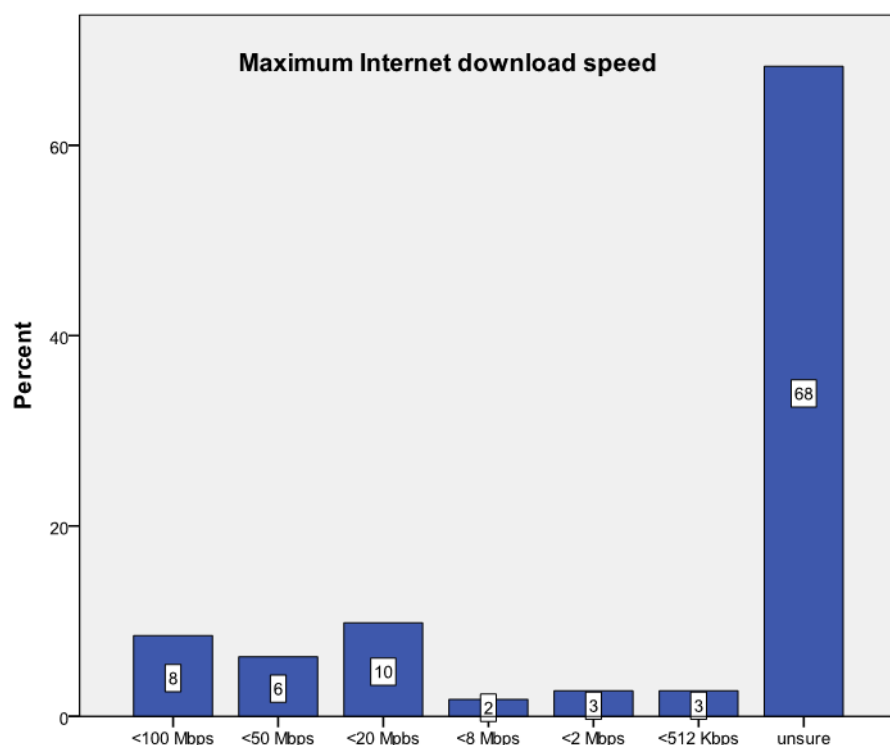


Figure 16: Household understanding of Internet data speed

In Australia, consumers have traditionally been offered Internet services with bandwidth caps that are priced on the amount of data users can upload and download in a month, and the rate of data transmission is not part of a retail pricing or service plan option. The speed actually experienced by end-users under ADSL and dial-up was dependent upon a number of factors: end-point files server performance; the varying quality of a connection available through the medium (wireless, copper, coaxial cable); service type (ADSL, WiFi, Satellite, dial-up); distance to transmission point (e.g. telephone exchange); household connections (modem, antenna, gateway); household hardware; and the volume of traffic or number of people using the service at the same time. Whilst relationships between the Internet and the household media ecology will continue to influence the speed and quality of Internet use under the NBN, what is now different is the possibility to choose between different banded options of data transmission rates as part of consumer retail pricing plans.

Despite this option, it appears that consumer knowledge about Internet plans remains dominated by past retail pricing options and measures based on volume rather than speed. This presents a problem for retailers trying to sell newer pricing options that differentiate by speed – as is the case with NBN wholesale and retail pricing – and it may help to explain the lack of consumer understanding about Internet speeds.⁵

Speed is often understood in a more intuitive way based on how accessing the Internet or using familiar applications feels and looks (buffering, real-time, lag etc), rather than in a more quantifiable way, based around measures or quantities of bits of data that are conveyed or processed per unit of time. This finding is also reflected in the ACMA (2007) report on Consumer Take-up and Use of Communication Services, which found that apart from 'enthusiastic embracers', many people are vague about the speed of service they subscribed to, with many unsure of the type of broadband they subscribed to – many just thought broadband was broadband.

⁵ This problem of understanding Internet data transfer speed is compounded by the difference between upload and download speeds provided by service plans.

If we compare knowledge of Internet data speed across household Internet connection types, NBN-connected homes are clearly more knowledgeable, with only 51% unsure of the maximum Internet bandwidth or data transmission speed available through their Internet connection, compared to 66% of ADSL households and 88% of wireless households. In addition, households who have ADSL or wireless do not have the infrastructure to support transmission speeds of 50 Mbps or greater, yet for each category 12% and 7% respectively answered that this was the household Internet speed (see Figure 17).

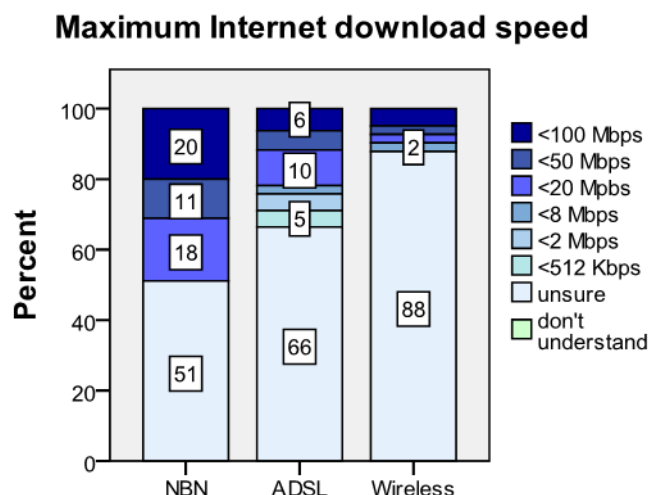


Figure 17: Comparison between household Internet type and understanding of Internet data speed

The qualitative data supports the survey findings that Internet speed is often understood in intuitive or experiential ways, but that NBN users tend to be more knowledgeable about quantifiable measures than those on other kinds of broadband services (which may be associated with the differences between active and passive decision-making):

NBN subscriber: *"We can download everything really quickly, I mean movies only take a couple of minutes, and Skype is fine, it's perfectly real time ok, it's not weird broken up pictures and I've seen that on Skype."*

ADSL subscriber: *"We're on ADSL2+ whatever that means. I'm not 100%, not even 50% up to date with speeds, it suits us, and it doesn't seem slow..."*

NBN subscriber: *"My DSL was about 10 megabits a second and this (NBN) is almost 25 or 30, so it's a lot faster."*

ADSL subscriber: *"I do feel ridiculous and I must take the time to find out what it is, but because we are not going to get it I haven't been all that interested, but I don't understand what broadband is."*

Household Internet and communication cost

How much do you spend per month for home Internet service?

Comparisons between the household Internet connection type and monthly amount spent on home Internet (excluding mobile phones) shows that households on the NBN are much more likely to spend more, with 73% spending more than \$50 per month, compared to 60% of ADSL homes and only 17% of wireless homes (see Figure 18).

In 2012, 70% of NBN connected households reported spending more than \$50 per month, compared to 56% of ADSL homes and 55% of wireless homes (see Figure 19).

Monthly cost of home Internet (2011)

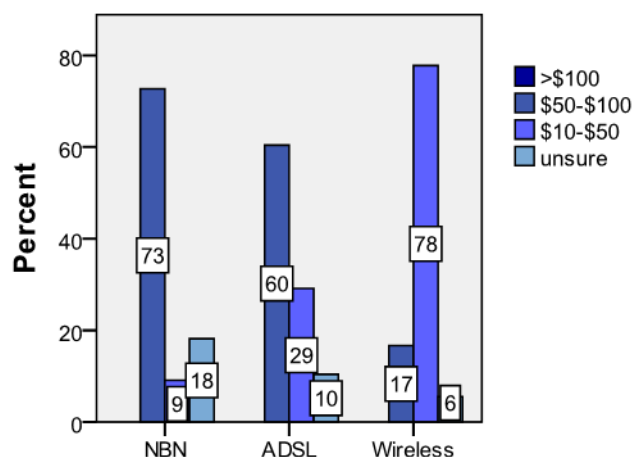


Figure 18: Comparison between household Internet type and amount spent per month on Internet service (2011)

Monthly cost of home Internet (2012)

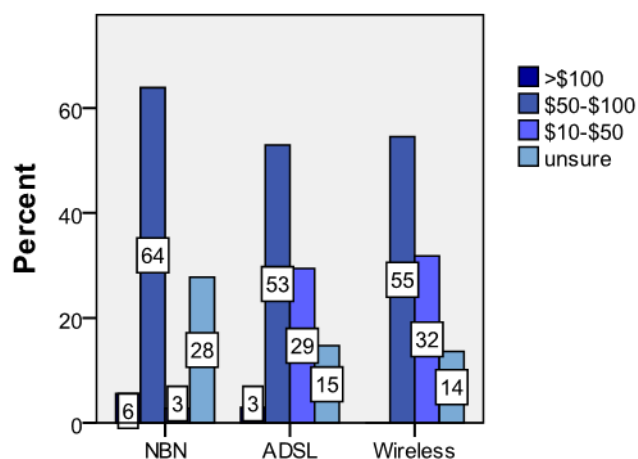


Figure 19: Comparison between household Internet type and amount spent per month on Internet service (2012)

Has type of Internet connection affected how much you spend for Internet service?

When asked whether the type of Internet connection has affected the cost of their home Internet, 11% of households that had taken up plans on the NBN reported that it had increased a lot, 26% that it had increased somewhat, 49% said it stayed the same, whilst 11% reported it had decreased somewhat, and 3% that it had decreased a lot (see Figure 20).

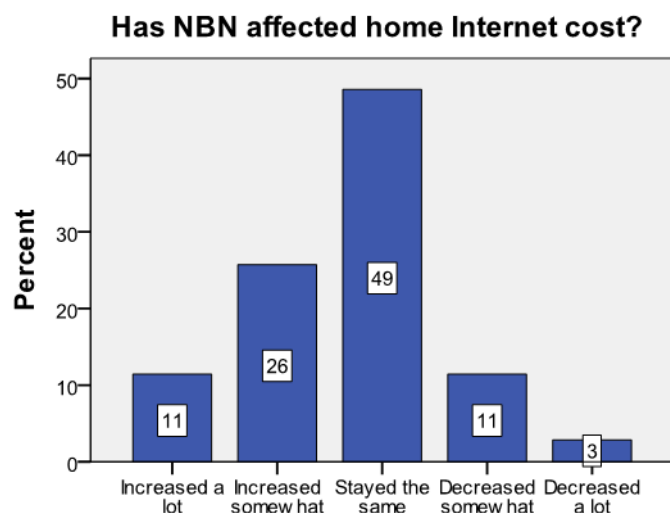


Figure 20: NBN households view of whether the NBN had affected household Internet cost

These data suggest that adopting high-speed broadband services on the NBN does not necessarily increase the cost of household Internet. Instead, for half of the households in this study, the NBN had no real impact on Internet cost. For those whose costs did increase, this was often accompanied by increased Internet speeds – and sense of value – whilst for those whose costs decreased this was often associated with a substitution of landline telephone for a VoIP service, in which the cost of data and voice were bundled in a single service plan – a reconfiguration of the household communications ecology.

How much do you spend in total per month on household communication services?

Comparisons between the household Internet connection type and total amount spent per month on household communication services (Internet + landline + mobile phones) show that households on the NBN are likely to spend slightly more, with 67% spending more than \$100 per month, compared to 65% of ADSL homes and only 41% of wireless homes (see Figure 21). This does not, however, account for variables such as numbers or composition of householders, or number and intensity of communication devices and their use.

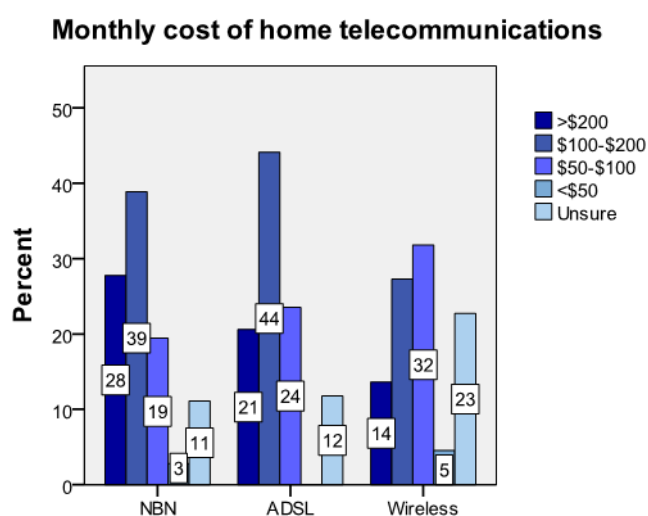


Figure 21: Comparison between household Internet type and total amount spent per month on communication services (2012)

The communication costs of wireless broadband households appear to differ from wired broadband homes for a number of reasons – they are often shared and rented houses with multiple Internet connections and mobile phones, but no landline telephone. Wireless homes are more like an arrangement of multiple individuals rather than a household unit in terms of their communication ownership, costs and ecologies.

Bundling

Bundling is an arrangement where multiple communication services (e.g. fixed-line telephone, Internet, mobile phone, pay TV) are combined in a single retail package. Typically, bundled communication services offer reduced costs through lower telephone call costs or free local calls. ACMA research shows that 52% of Australian households have opted for bundled communication services (ACMA, 2010). The proportion of bundled arrangements is reflected in our research, where 56% of respondents had a bundled service.

We found that the number of NBN connected households that had a bundled service rose from 46% in 2011 to 58% in 2012 (see Figure 22). So, whilst those who initially took up an NBN plan were less likely to bundle their Internet with other communication services this changed over the course of 2012. This may be related to the growth in Internet service providers releasing plans and different product packages on the NBN over time. Over the same period the number of households on other fixed broadband services that had a bundled Internet service decreased from 64% and 44% (see Figure 22). These households either shifted to an un-bundled Internet service, or perhaps switched to another type of Internet service (NBN, wireless) – and perhaps helped to account for the growth in NBN subscribers and the growth in NBN bundled plans as they became available.

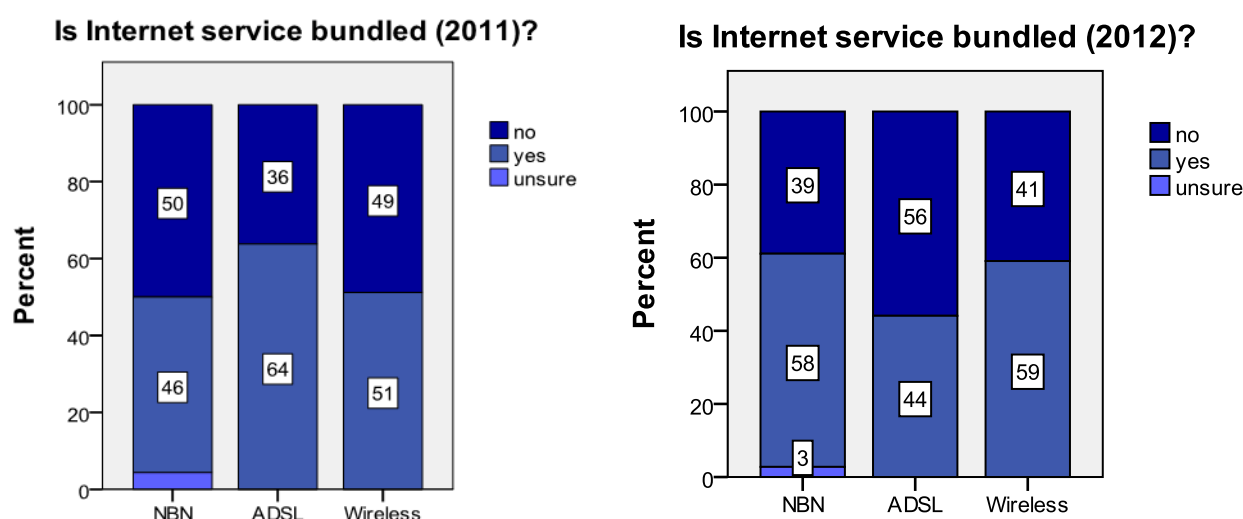


Figure 22: Comparison between Internet type and households with a bundled communication service in 2011 and 2012

Amongst the different ISP bundling packages available, ACMA research shows that the most popular packages combine fixed-line telephone with Internet (45%), whilst bundling Internet, fixed-line telephone and mobile phones is the next most popular (29%) (ACMA, 2010). We found the same pattern overall for households that have a bundled package. Bundling Internet with landline-only remains the most common across all broadband types – including NBN households (71%). Yet, there is a noticeable difference in the patterns of bundled arrangements in comparisons between types of household broadband. NBN and wireless households tend to have greater variety of bundled arrangements than ADSL homes; and there is a trend towards bundling arrangements that do not include a landline phone, just Internet with mobile phones, amongst NBN households (14%) (see Figure 23). This trend is even more pronounced amongst wireless households (31%) (see Figure 23).

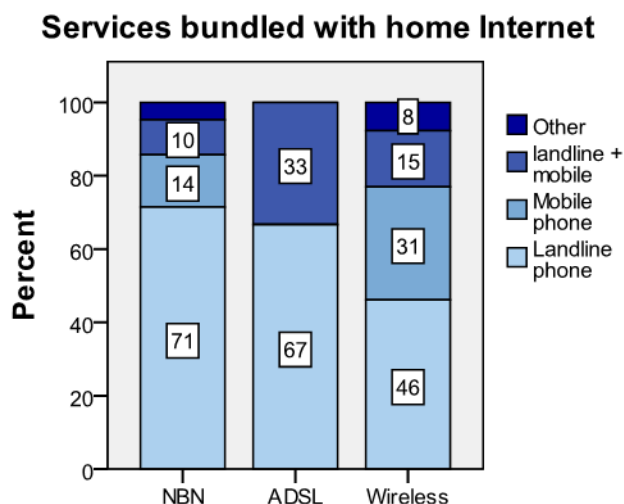


Figure 23: Comparison between household Internet and bundled communication services (2012)

Bundled plans have traditionally combined separate products or services into a single retail package and price, such as fixed-line service with Internet and with mobile services. More recently, ISPs are offering bundled communication services that combine voice and data in the same Internet service product. Substituting a landline telephone for a VoIP one eliminates the cost of the fixed-line phone rental fee and so offers a strong incentive. Whilst service providers are increasingly offering VoIP services as part of a broadband package (ACMA, 2010), it is difficult to determine how consumers understand or conceptualise them in relation to other communication technologies.

Landline substitution

Comparison between household Internet type and use of a landline telephone shows that the use of a landline varies according to household broadband type. 74% of ADSL households had a home fixed-line or landline phone, compared to 56% NBN households and only 36% of wireless homes (see Figure 24). These proportions remained fairly consistent across the two surveys.

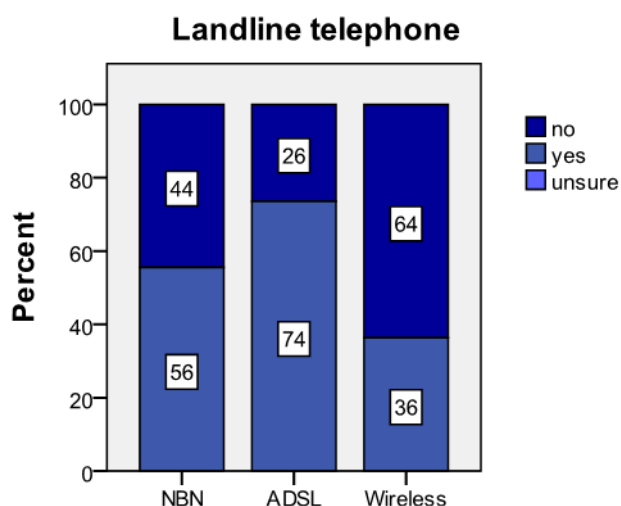


Figure 24: Comparison between household Internet type and use of landline telephone

Australian Internet users are increasingly familiar with Internet-based VoIP platforms or services, such as Skype and Facetime (Ewing and Thomas, 2012), yet the take-up rate of an ISP provided fixed-line VoIP service, which transmits voice communication as data packets via the Internet rather the telephone network and so mirrors the legacy telephone network from a user's experience, is currently much less common (ACMA, 2010).

We found that 60% of people had used some kind of Internet telephony – and this was fairly consistent across all household broadband types. For those who used a VoIP service, a large proportion across all household broadband types only used an Internet-based platform such as Skype or Facetime. A much smaller proportion used an ISP offered VoIP service, or a combination of both Internet and ISP VoIP. Comparisons between household broadband and the type of Internet telephony used revealed that NBN households were more likely to use an ISP offered VoIP service, with 30% using an ISP VoIP, as opposed to 10% of ADSL households and 13% of wireless homes (see Figure 25).

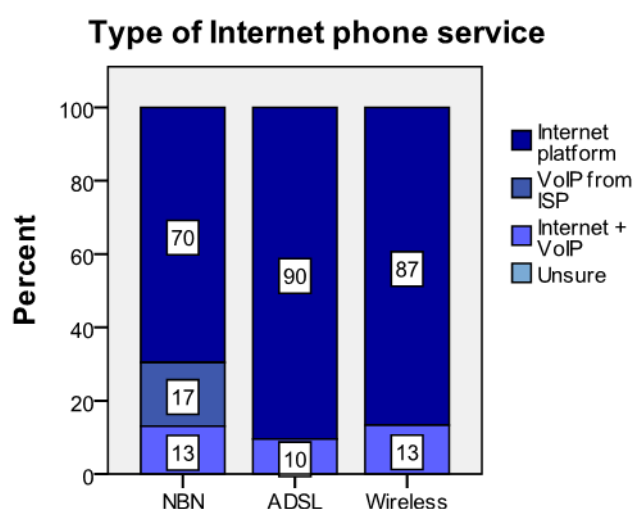


Figure 25: Comparison between household Internet and type of Internet telephony used

When we asked about the most common device to make a voice call from home, mobile phones were clearly more popular than landline or Internet calls across all household broadband types. Nevertheless, there were distinct differences and patterns of voice calling between household Internet types. ADSL households were much more likely than other broadband homes to use a landline phone, with a third of ADSL households reporting the landline phone as the most common device for making voice calls. Wireless broadband homes almost exclusively preferred the mobile, with 95% reporting mobile phones as the most common device for making voice calls (see Figure 26). NBN connected homes were the only ones to report a VoIP phone as the most common method of making a voice call, with 6% of respondents (see Figure 26).

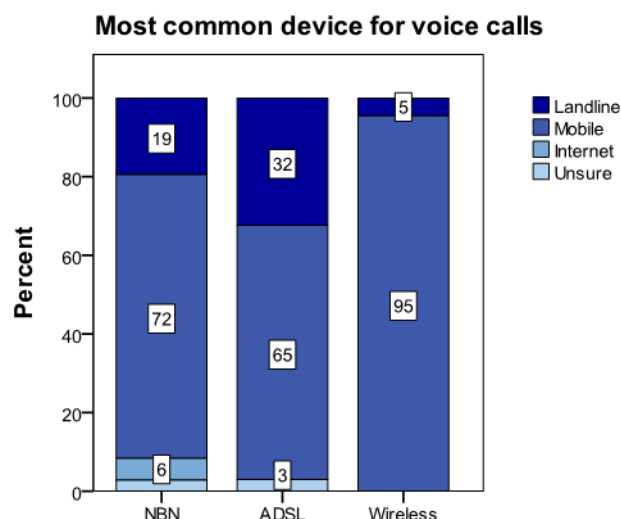


Figure 26: Comparison between household Internet type and most common device for voice calls

The qualitative data supports the survey findings on use and substitution of landline, and explains some of the reasons for the different voice communications between household broadband types as part of the home media ecologies. As one would expect, wireless homes predominantly use mobile telephony as their primary mode of voice communication (substituting landline with mobile) for reasons of cost, flexibility and mobility. ADSL homes tend to stick to an older communications regime and ecology where the landline phone maintains an important place (complementing landline with mobile), in order to maintain a spatially fixed and located number. In contrast, NBN homes have shifted to a more convergent ecology and tend to substitute landline for VoIP (which is complementary to mobile), for reasons of cost and usage:

ADSL subscriber: *"I hate mobile phones, I hate computers, I like the telephone. I grew up with the telephone and the typewriter."*

"You can get your phone to go through your computer, and that's cheaper isn't it? And what's that called?"

"I reckon in the next few years we will probably get rid of it (landline), I don't know. It depends on what we will replace it with. In the near future it'll probably get replaced with something else, but as to whether its mobiles or voice over IP or something else I don't know what that would be, but yes I imagine it will go...both of us have mobiles, so that would be the logical step."

Wireless subscriber: *"we don't have a telephone or a television. I use my Internet to listen to radio in my room. We watch i-view and do skype calls"*

NBN subscriber: *"We don't have a landline, we use VoIP...the landline coming in is the whole access and the VoIP phone is attached to the system, so we don't have a separate stand alone line, so that price covers everything..."*

"...now it's all connected and so that \$109 covers everything: our phone, Internet, local, interstate, mobile calls. So it's worked out okay..."

"I do use skype from work to here sometimes, or if the kids are on the computer I skype em rather than phone them, cause they're on the line, I've got a brother in Queensland and friends overseas we skype. Skype is the only voice over we use."

"I had a landline before because that was part of the package – now its VoIP and broadband."

Household media ecology

How many of the following devices are in use in your house?

Overall, the average number of media and communication devices per household in a our survey data showed that there are more mobile phones (2.59) and notebooks/laptops (1.96) per household than landline phone handsets (1.06) and desktop computers (0.82) in the hardware ecology of households. This pattern of household device population remains fairly consistent when we compare between different household broadband types, with laptop computers and mobile phones much more populous than other media and communication devices (see Figure 27).

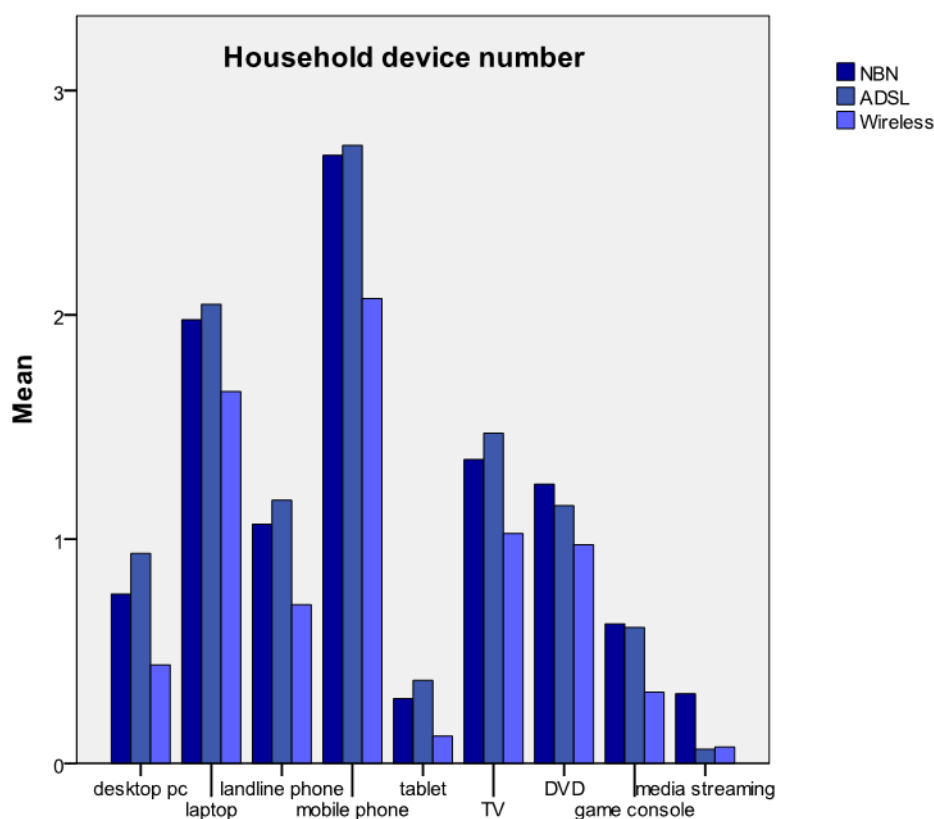


Figure 27: Average number of media and communication devices per household by broadband type

This household device data supports previous research showing that overall the number of household desktop computers are declining, whilst the number of alternative devices to access the Internet in the home – notebooks/laptops, tablets, smart phones – are increasing. Similarly the data supports evidence that fixed line phones are steadily being disconnected and going through a process of being replaced or substituted for alternative kinds of telephony – mobile or VoIP. The data also supports the literature, showing that the total number of household media and communication technologies is steadily accumulating in homes. Our findings suggest that these home media ecology trends are not dependent upon type of household broadband, but implicate all households regardless of their Internet access and use.

Has type of Internet connection affected upon the number of connected devices in your household?

When asked whether the type of Internet connection had affected the number of household devices that connect to the Internet, 30% of households that had taken up plans on the NBN reported that it had either increased somewhat or a lot, compared to 21% of ADSL households and 19% of wireless homes (see Figure 28).

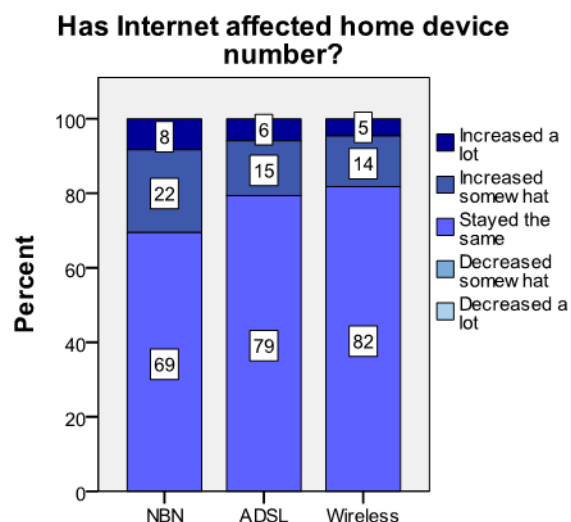


Figure 28: Household Internet connection and view of its impact on device number

Is the home Internet connection shared by multiple devices using a wireless connection?

The proportion of households that have a wireless router is higher in NBN homes (91%), than ADSL (80%) or wireless homes (64%) (see Figure 29).

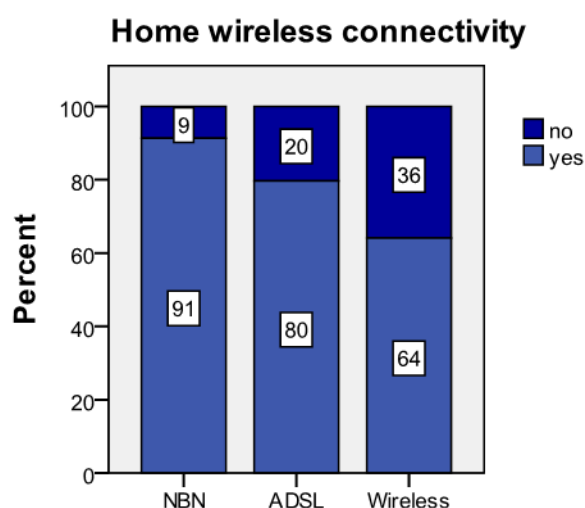


Figure 29: Comparison between Internet type and in-house wireless connectivity

What device is used most often to access the Internet from home?

When we asked which device was most often used to access the Internet from home, laptop or notebook computers were clearly the most common way to go online regardless of household broadband connection. Nevertheless, there were some comparative differences between wired and wireless households. Desktop computers were the second most common device to access the Internet in NBN and ADSL households, but in wireless homes desktop Internet access was much less pronounced in 2011 (7%) and by 2012 (0%) had been well and truly overtaken by the proportion of households using mobile phones (18%) or tablets (14%) as the primary device to access the Internet from home (see Figure 28).

This emerging trend in Internet access device became clearer over the period of the research. It was less defined than in wireless homes but also observable in fixed-line broadband homes, where the proportion of ADSL houses using a mobile phone as the most common device to access the Internet from home rose from 6% in 2011 to 15% in 2012; and the proportion of NBN houses using a tablet as the most common device to access the Internet from home rose from 6% in 2011 to 11% in 2012 (see Figure 30).

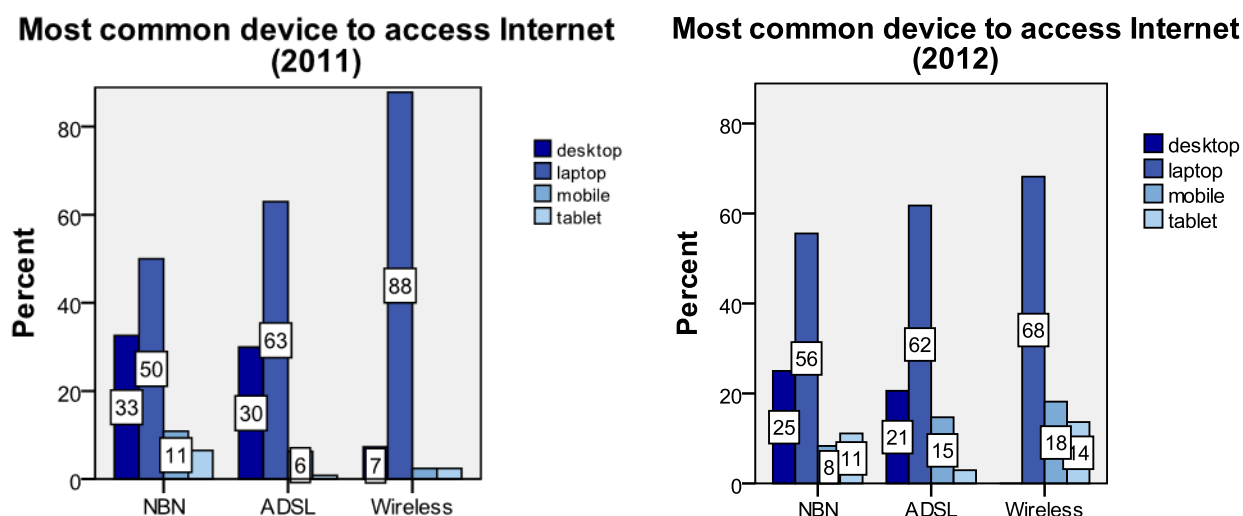


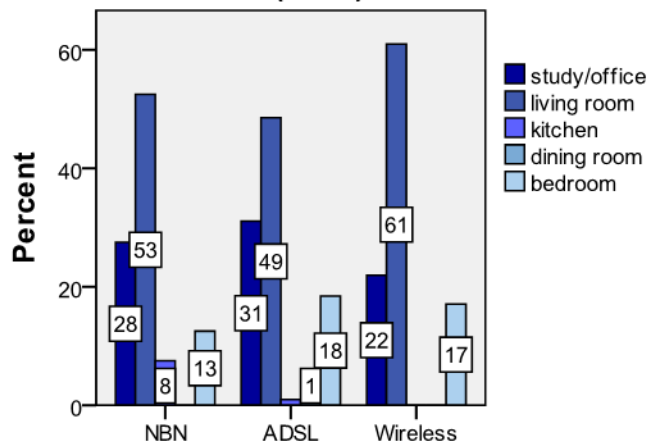
Figure 30: Comparison between Internet type and most common device for accessing the Internet in 2011 and 2012

In what room is the Internet most commonly accessed?

The overall pattern for Internet access by room shows that the living room is a more popular place than any other across all broadband types to access the Internet from – over 40% of households in every Internet type and survey (see Figure 31). This is typically followed by the study, the bedroom and then the kitchen and dining room. This diversity of places in the home to access the Internet signals a decline in dedicated home spaces to access the Internet and it is associated with the overall pattern observed in which household device population and Internet access device is shifting from singular, wired and fixed to multiple, wireless and mobile.

The location of Internet access does appear to differ, however, between wired and wireless broadband households. NBN and ADSL broadband homes had a similar pattern of room Internet access; whereas wireless connected homes were comparatively less likely to use the study or office, and more likely to use the bedroom to access the Internet. This pattern became clearer over time, with only 14% of wireless homes reporting the office/study, but 32% reporting the bedroom, as the most common room to access the Internet. Moreover bedroom Internet access rose amongst all types of broadband households across the period of the research.

**Most common room to access Internet
(2011)**



**Most common room to access Internet
(2012)**

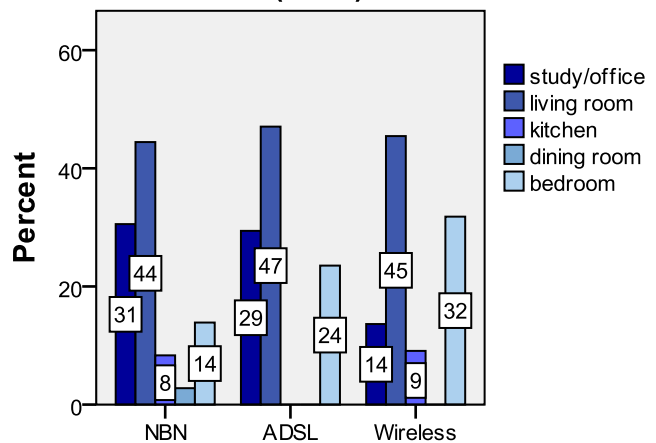


Figure 31: Comparison between Internet type and most common room for accessing the Internet in 2011 and 2012.

Ewing and Thomas (2012) found different patterns of rooms used to access the Internet, with nearly half of those accessing the Internet at home doing so in a room designated as a study suggesting, they argue, a strong relationship between household computers, Internet use and the home office. They did find, however, signs that Internet access is beginning to move more towards entertainment and related uses with a slight decrease in study access and a small increase in bedroom, living room and lounge room access. Our research suggests that this trend is now well underway.

Yet, such communication ecologies and patterns are not consistent across all household broadband types. Along with Internet and communication costs, the media ecologies of wireless broadband homes appear to differ from wired broadband homes. Their substitution of desktop computers for laptops is more pronounced, as is their substitution of landline phones for mobile phones, and they are more likely than NBN or ADSL homes to access Internet and other media content in bedrooms. These differences seem to occur at a more individual rather than household scale of organisation, and thus appear to reflect a different composition and relationship of householders rather than a different orientation to media and communication technologies.

The household media ecology trends of greater diversity in the kinds, numbers and places of Internet and device use identified in the survey data are reflected and fleshed-out in some of the qualitative data, in which householders describe where, how and when they access the Internet:

“The devices have changed where we access the Internet more so than the NBN, but the NBN itself is I suppose what’s prompted us to be able to device-up. So we can get it everywhere now, we can get it out in the backyard.”

“There are 4 screens in the house, two notebooks and two PCs, there are no desktops, the whole place is wireless and laptop, so we access the Internet all over the house and we use it a fair bit.”

“We have a couple of computers and the play station, and we run everything through a wireless router. It’s all notebooks now, which works perfectly for us. And you can wander around and do it wherever you want and not have to sit in one room.”

“Sometimes I work down here with a laptop, but usually up there in the office with a laptop, and it’s connected to a wireless connection, so it’s all buzzing around.”

"In this room we have networked PCs, the girls are all on laptops and there is wireless access set-up in the place...they use them more in their bedrooms..."

"The Internet is probably switched on at 8 in the morning and off at half past 12 at night..."

"Here we have 2 notebooks, an iPad, a T-hub, and phones...we got rid of the desktop 5 years ago but I should have bought another one, because I never move that notebook, well I do bring it down here occasionally, but now that iPads are available notebooks seem big and heavy."

The qualitative data on household media ecologies also reveals the challenges associated with device accumulation, functionality, interoperability and management. This data shows that media ecology issues include installing or integrating new devices or services into household media ecology; the need to upgrade equipment to support speeds of new infrastructure; where to locate routers or other equipment to ensure service and compatibility; managing different accounts and service providers for different communications services; maintaining computer and Internet equipment; and engaging the household ecology with external networks:

"Initially there were difficulties getting it set up, but that's what the techno-guys are very good, they came and sorted it out. I think we are on our third T-box, 2 have conked out, they played up, probably one of the cables was dodgy. We had very poor signal coming from the Wifi so they had to install a signal amplifier, a boost to the Wifi. We had a Wifi before but they gave us a new modem..."

"Certainly the NBN is faster, there is no doubt about that ... but the Wi-Fi diminishes the speed of the service undeniably. If I bring my notebook down here and put it right next to the modem it's a lot faster than if I work up in my office."

"We have a landline telephone through Telstra, I don't have a mobile but all the girls do so there's 4 of them all through Optus. And the Foxtel is on the Telsra bill. So there's multiple bills."

"I've got a guy around the corner who is a computer technician so I generally ring him and pay him if there any issues, but I don't seem to call him very often. We got a big virus and he came round and rebuilt parts of it, not physically, but cleaned off or whatever the terminology is and it seems to be going fine at the moment. I'm thinking of turfing the whole lot out, we've had the PCs for 6 years and I'm thinking the technology is yesterday's; I like the size of the monitors, I'm thinking we could upgrade."

"With Skype, occasionally you have problems with buffering. But I just assumed it was at their end, not my end, with server issues or something like that. I have no idea whether that is the case or not. When I have had problems at my end it was on the play station and the networking on the Playstation is a bit funny."

Digital participation

At home, what activities do you use the Internet for?

Comparing differences between household Internet connection types and online activities or digital participation shows that there are similarities across households for more basic kinds of information searching or email communication. Yet, NBN connected homes are much more likely to undertake a greater variety and more sophisticated online activities (see Figure 32). We must, however, be careful not to attribute a causal relation between the NBN and digital participation, as those seeking an NBN plan appear to already be enthusiastic and knowledgeable Internet users. Nevertheless, NBN connected homes are more likely than either ADSL or wireless homes to shop online, to use instant messaging, to use entertainment services such as downloading or streaming music or playing games, and to access a greater range of online services for health, employment and government.

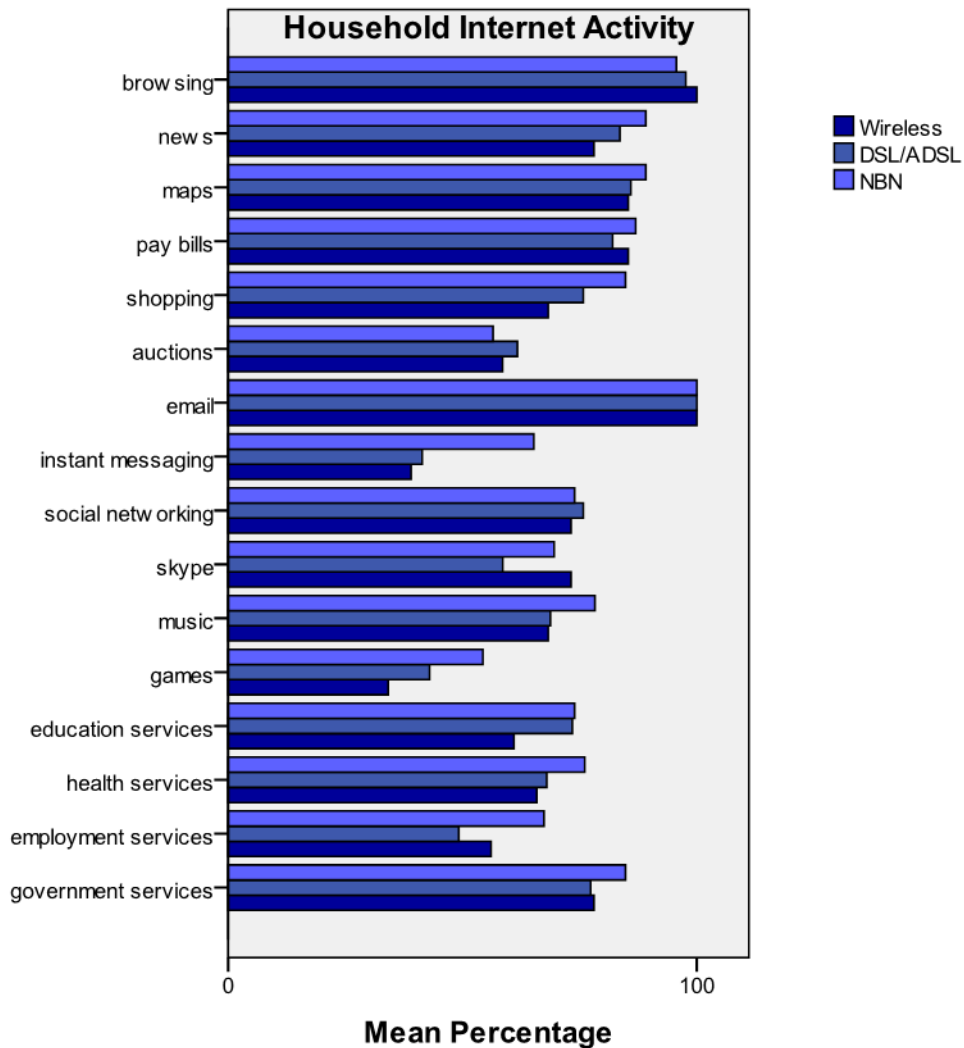


Figure 32: Comparison between Internet type and activities undertaken on the Internet

Has your type of household Internet connection affected how much you use the Internet?

When asked whether the type of Internet connection had affected volume of home Internet use, 62% of households that had taken up plans on the NBN reported that it had either increased somewhat or a lot, compared to 50% of ADSL households and 43% of wireless homes (see Figure 33).

Has Internet type affected usage levels?

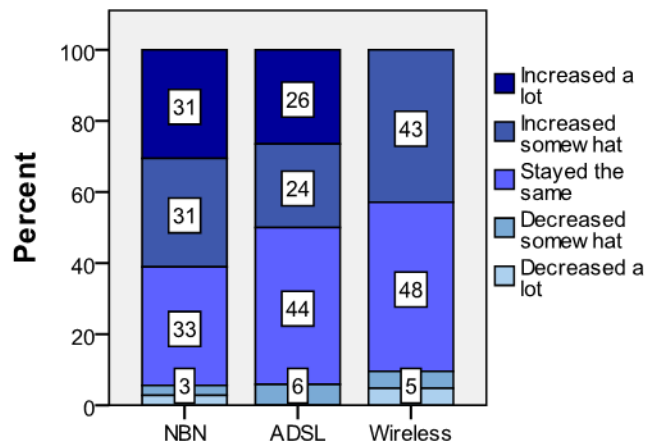


Figure 33: Household Internet connection and view of its impact on Internet use

Is your home used as a place of business or for paid work?

NBN users are more likely to use their home as a place of work, with 30% of households reporting that their home is used as a place of business or for paid employment, compared to 15% of both ADSL and wireless households (see Figure 34).

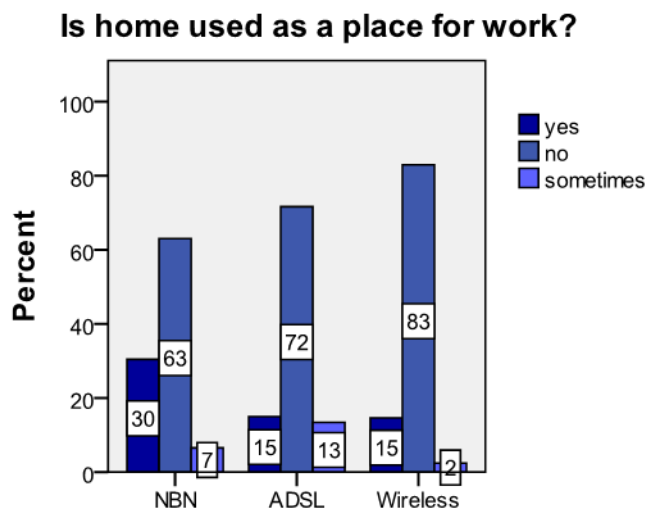


Figure 34: Comparison between Internet type and home-based business or work

The digital economy addresses people's ability to access the range of digital infrastructure and communication technologies that now mediate economic and social activity (e.g. ACMA, 2009); yet it encompasses more than access to these resources to include people's knowledge and capacities to engage with and through technologies in order to foster economic prosperity and social participation (e.g. Warschauer, 2003). Our research suggests that high-speed broadband services on

the NBN are associated with increased participation in the digital economy for both work and leisure.

Views on the NBN

The role that the NBN can play to help build Australia's digital economy is supported by existing research, with Ewing and Thomas (2012) showing two thirds of people think the development of the NBN is a good idea. We found similarly strong support for the concept and development of a national broadband network, with 82% of surveyed households either agreeing or strongly agreeing that the NBN is a good idea. When compared between household broadband types slight differences emerged in support of the NBN, but overall it remained strong, with 89% of NBN households either agreeing or strongly agreeing that the NBN is a good idea, compared to 79% of ADSL households and 82% of wireless homes (see Figure 35).

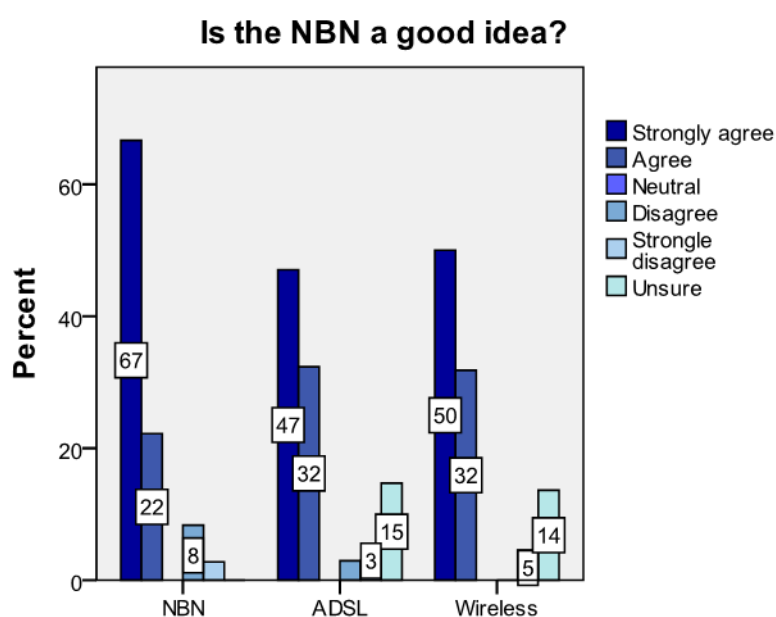


Figure 35: Comparison between household Internet type and view of the NBN

When asked why they thought the NBN was or was not a good idea, the most common reason people thought the NBN was a good idea related to the Internet service it would provide, with 24% saying because it would be faster and 18% saying it would be better quality Internet. The second largest set of reasons for support of the NBN related more to national benefits across a range of factors, including building an infrastructure for all Australians (14%), which would be beneficial for the future (11%), would improve national productivity (8%), and would help us maintain global competitiveness (6%). Other reasons noted were the importance for connecting and including rural Australia (5%) and keeping up to date with developments in technology and innovation (5%). In contrast to this raft of positive reasons for supporting the NBN, a small percentage of respondents had negative views, with 6% thinking it was either too costly or a misdirected use of government funding, while 2% thought the project itself was too complex and suffering delays (see Figure 36).

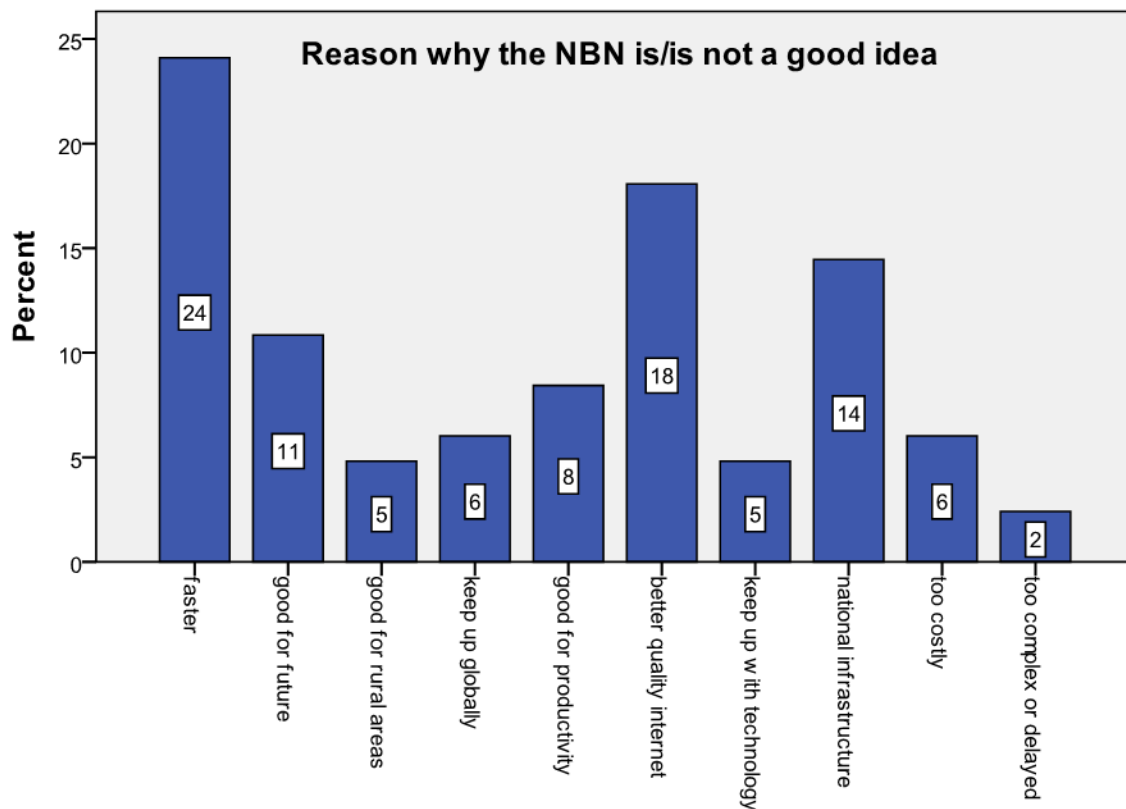


Figure 36: Reason for thinking the NBN is or is not a good idea

The qualitative data supports and elaborates on the survey findings that the NBN can help to play an important role in building and including people within Australia’s digital economy. The comments from participants show that support extends from household to national benefits, from economic productivity to rural digital inclusion, yet some doubts are expressed about the potential of the pricing model and the commercial imperatives of Internet service providers to exclude some people:

“I think the faster Internet the better, just in terms of less frustrating, you get information quicker and easier and enables you to get on with what you are doing.”

“I think it’s a good thing. It will help face to face over the Internet communication.”

“Hopefully it will reduce the need for travel and car use when more people can work from home. I think it should be rolled out in rural areas first though. That’s where the real need is. We city folk get everything!”

“I don’t know about it (NBN) to say one way or another, but what I am interested is for people who live in the country or remote areas to have access to information. Anything that makes it easier for them and the sort of life they live I am quite prepared to finance that.”

“I have no idea if it is what Australia needs, but someone thinks it is enough to have a crack at it. I don’t need it in that I don’t know how to exploit it fully, but I suspect businesses, tertiary institutions, industry will probably profit from it”

"I think for Australia, for the economy it will be a great thing, just having that access to overseas, and for education. Because of the speed and the ability to upload and download so much faster, I was speaking to a guy up the road who has an art business and he said 'it's fantastic for us, because we can upload download images quick', so from their perspective it's a great thing."

"It's a good idea. Someone is always gonna tell you there is a better system, better technology, better something. But you need to have that backbone that allows you to do all the other things, and it's a good start that you can add to later..."

"I think it's amazing, but I think the government needs to pull the telcos into line. If we are spending \$36 billion on this rollout – I am not technical savvy enough to know if this is the right way to go but we need it, we need to move with the times and keep and the world is such a connected place now, so I think it's a fabulous thing. But that being said I think the government needs to keep the telcos into line giving us that full speed. What's the point of \$36 billion if you are only going as fast as ADSL cause you can't afford \$100 a month. And people won't take it up...."

Conclusion and future implications

This research has traced early stages of high-speed broadband adoption and appropriation in Brunswick, one of the early release sites of the National Broadband Network.

The findings from this research reveal a relationship between NBN adoption and household composition, ownership and income, which may represent a barrier to broader adoption.

The households who had taken-up an NBN plan were clearly more knowledgeable consumers of broadband technologies, and displayed a more active engagement compared with the inertia that characterised many non-NBN users and their interaction with Internet service provision. As such, the study participants reflect common models of early adopters and therefore may have limited relevance to the broader population.

The study showed that initial problems faced by households in installing and connecting the NBN were overcome fairly quickly, suggesting such issues are only temporary. Over time, it became apparent to many consumers that plans on the NBN were often comparable or cheaper, especially when substituting landline for VoIP telephony. This implies a need for further efforts to inform consumers about developing communications technologies, their uses, and costs.

The NBN is part of ongoing shifts in household media ecologies, in which device accumulation and Internet access is moving from singular, wired and fixed to multiple, wireless and mobile. Yet, NBN connected homes are more likely than other fixed-line broadband households to have a convergent communications ecology, to use their home for business or telework, and to engage in a greater variety of online activities.

Broader benefits of the NBN infrastructure for economic, community and social participation seem to be well accepted; yet these are also compromised by a lack of knowledge or literacy about broadband technologies, as well as a concern about household communication costs and difficulty navigating a complex telecommunications and Internet marketplace.

The broadband adoption trends and appropriation patterns identified in this research are, in the context of the national broadband rollout and expected growth in Internet applications, only preliminary. Further research is required as the rollout reaches more places across Australia, and is habituated into homes over time. A number of issues and future developments on the horizon include:

- the process of decommissioning the copper network and how this is understood by, and impacts upon, households;
- the future of legacy special-purpose services such as the payphone service, the emergency call service, the National Relay Service (to support people with impaired speech and hearing), and some other services such as public alarm systems and traffic lights that had relied upon the public switched network;⁶
- the growth in VoIP services offered by service providers and how these are appropriated by consumers within broader in patterns of communications substitution and complementarily;
- the emergence of a tiered pricing model for broadband product offerings and how homes and businesses will adapt to the opportunities afforded by different symmetries of download and upload speed;
- the potential for competition in the retail service market afforded by the open access wholesale business architecture of the NBN and what this will mean for consumer products and prices;
- the multiple access points built into the Network Termination Device and how this may impact upon household communications ecologies; and,
- the evolving public discussion and perception of the NBN in the contexts of community engagement (e.g. Digital Hubs program), and alternative broadband delivery models (e.g. fibre-to-the-node).

⁶ Telecommunication Development Sector (2012) 'Toward universal broadband access in Australia –The National Broadband Network' ITU report prepared by Colin Oliver.

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References

- Access Economics. (2010), *Impacts of Teleworking Under the NBN*. Report prepared for the Department of Broadband, Communications and the Digital Economy (DBCDE). Canberra, ACT.
- Allon, F. 'An Ontology of *Everyday Control: Living and Working* in the "Smart House".' *Southern Review* 34.3 (2001): 8-21.
- Apperley, T., Nansen, B., Arnold, M. & Wilken, R. (2011) 'Broadband in the Burbs: NBN infrastructure, spectrum politics and the digital home'. *M/C: A Journal of Media and Culture* 14.4.
- Arnold, M. (2004) 'The Connected Homes Project: Probing the Effects and Affects of Domesticated ICTs', in A. Bond (ed.) *Artful Integration: Interweaving Media, Materials and Practices*, Vol. 2. Proceedings of the Eighth Biennial Participatory Design Conference, Toronto.
- Anold, M, Shepherd, C, Gibbs, M, and Mecoless, K. (2006) 'Domestic Information and Communication Technologies and Subject-Object Relations: Gender, Identity and Family Life', *Journal of Family Studies*, 12: 95-112.
- Australian Bureau of Statistics (2012) *Household Use of Information Technology, Australia, 2010-11*. Canberra: ABS.
- Australian Communications Consumer Action Network (ACCAN) (2011). *National Broadband Network: A Guide for Consumers*. A project prepared by the Internet Society of Australia (ISOC-AU) and the ACCAN.
- Australian Communications and Media Authority (ACMA) (2007). *Media and Communications in Australian Families 2007*. Report for the Media and Society Research Project. Canberra: ACMA.
- Australian Communications and Media Authority (ACMA) (2008). *Telecommunications Today Report 5: Consumer choice and preference in adopting services*. Canberra: ACMA.
- Australian Communications and Media Authority (ACMA). (2009). *Australia in the Digital Economy. Report 2: Online Participation*. Canberra: ACMA.
- Australian Communications and Media Authority (ACMA). (2010). *Take-up and Use of Voice Services by Australian Consumers*. 2009-2010 Communications Report Series. Canberra: ACMA.
- Battersby, L. (2010) 'Quantity, Not Speed, is Web Nirvana.' *The Age* 1 May 2010.
- Brown, D. (2010) 'NBN Now 10 Times Faster.' *The Mercury* 13 August, 2010.
- Conroy, S, (Minister for Broadband, Communications and the Digital Economy). (2009) 'New National Broadband Network'. Australian Government, Canberra, 7 April 2009.
- Department of Broadband, Communications and the Digital Economy (DBCDE). (2011) *Submission to the House Standing Committee on Infrastructure and Communications: The Role and Potential of the National Broadband Network*. Canberra: DBCDE.
- Ewing, S., and Thomas, J. (2012) *The Internet in Australia*, CCI Digital Futures (2012). Melbourne: ARC Centre of Excellence for Creative Industries and Innovation Swinburne University of Technology.

- Gregg, M., and Wilson, J. (2011) Willunga Connects: A baseline study of pre-NBN Willunga. DEEST: Adelaide.
- Grubb, B. (2010) "Connect to NBN Now or Pay Up to \$300 for Phone Line." *The Sydney morning Herald* 15 October 2010.
- Hearn, G., and Foth, M. (2007). 'Communicative Ecologies: Editorial Preface', *Electronic Journal of Communication* 17(1-2).
- Lally, E. (2002) *At Home with Computers*. Oxford: Berg.
- Livingstone, S., (2009) *Children and the Internet: Great Expectations, Challenging Realities*, Polity, Cambridge.
- Maher, A. 2008. *Digital Inclusion Initiative*, Melbourne: Infoxchange.
- Marvin, C. (1988) *When Old Technologies Were New*. New York: Oxford University Press.
- Moreland City Council. <http://www.moreland.vic.gov.au/>.
- Nansen, B, Arnold, M, Gibbs, M, Davis, H. (2009) 'Domestic Orchestration: Rhythms in the Mediated Home'. *Time & Society* 18(2) 181-207
- Nansen, Bjorn, Michael Arnold, Martin Gibbs, and Hilary Davis. (2010) 'Time, Space and Technology in the Working-Home: An Unsettled Nexus.' *New Technology, Work and Employment* 25.2: 136-153.
- Nansen, B, Arnold, M, Gibbs, M, and Davis, H. (2011) Dwelling with Media Stuff: Latencies of Materiality in Four Australian Homes. *Environment and Planning D* 29.4: 693-715.
- NBN Co Limited. (2010a) *Building Our National Broadband Network*. Sydney: NBN Co.
- NBN Co Limited. (2010b) *Product and pricing Overview for Access Seekers*. Sydney: NBN Co.
- NBN Co Limited. (2011) *NBN User's Guide*. Sydney: NBN Co.
- Sensis. (2009). *Sensis e-Business Report: The Online Experience of Small and Medium Enterprises*. Sensis
- Shepherd, C, Arnold, M, Bellamy, C, and Gibbs, M. (2007) 'The Material Ecologies of Domestic ICTs', *The Electronic Journal of Communication*, 17(1-2),
- Silverstone, R, and Hirsch, E. (1992) *Consuming Technologies: Media and Information in Domestic Spaces*. London: Routledge.
- Spigel, L. (1992) *Make Room for TV: Television and the Family Ideal in Postwar America*. Chicago: University of Chicago Press,
- Spigel, Lynn. "Media Homes: Then and Now." *International Journal of Cultural Studies*, 4.4 (2001): 385–411.
- Tacchi, J. (2006). 'Studying Communicative Ecologies: An Ethnographic Approach to Information and Communication Technologies (ICTs)', In *Proceedings 56th Annual Conference of the International Communication Association*, Dresden, Germany.
- Telecommunication Development Sector (2012) 'Toward universal broadband access in Australia –The National Broadband Network' ITU report prepared by Colin Oliver.
- Trulove, J.G. (2003) (ed.). *The Smart House*. New York: HDI.
- Tucker, R. (2010). "Broadband Facts, Fiction and Urban Myths." *Telecommunications Journal of Australia*, 60.3: 43.1 to 43.15.
- Venkatesh, A. (2008) "Digital Home Technologies and Transformation of Households." *Information Systems Frontiers* 10: 391–395.
- Warschauer, M. (2003) *Technology and Social Inclusion: Rethinking the Digital Divide*. Cambridge: MIT Press.

- Wilken, R., Arnold M., and Nansen B (2011) "Broadband in the Home Pilot Study: Suburban Hobart." *Telecommunications Journal of Australia*. 61.1: 5.1 to 5.16.
- Wilken, R. (2011) *Teletechnologies, Place and Community*, Routledge, NY