

Australia's Potential Internet Futures: Incasting Alternatives Using a New Technology Images Framework

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Abstract

Australia's Federal Government announced the National Broadband Network (NBN) in 2009. NBN's current roll-out is scheduled for completion in 2021, with market forecasts estimating optical fibre overtaking DSL broadband connections in about 2015. This paper provides a timely contribution to more critical and expansive analysis of potential Australian internet futures. First, 'schools of thought' and current technological frames (Web 2.0, 'the cloud') for the internet and its possible futures are outlined, which provide perspectives on the emergence of the NBN. We then outline five generic images of the future which, as predetermined images, enable quick 'incasting' of alternative futures for a technology topic or related object of research: promised future, social/speculative bubble(s), unfolding disruption/chaos, unintended consequences, and co-existence/'co-option'. High-level application of the 'schools' and generic images to the NBN and Australia's potential internet futures, suggests policymakers and strategists currently consider too few perspectives.

Keywords: national broadband network, internet, incasting, technology foresight, Australia

Introduction

Analyses of internet futures often outline prevailing trends – such as the shift towards mobile internet and personal/business data capture and analysis – and project major, positive, rapid changes to business, politics and daily life. However, trends constantly evolve and can change dramatically, rendering earlier forecasts obsolete. 'Virtual worlds' like Second Life were touted as innovations that would rapidly alter online business and marketing – only interest waned and shifted to educational uses (Salomon, 2010). Conversely, popular social networks like Twitter were

initially dismissed – only to rapidly become mainstream, due in part to celebrity uptake (Burns and Eltham, 2009).

This article develops an alternative approach to technology foresight, and on prospective thinking about Australia's internet futures. Analyses are reframe-able expressions of *one* of *many* 'schools of thought' or mental models on internet futures. We suggest a shift in focus towards alternative futures, and the theoretical and analytical perspectives can inform this analysis. We use a mixed-method approach to consider potential internet futures, identify generic categories of future images, and consider these for 'incasting' a focal topic thereby deductively conceptualising alternative futures (Dator, 2002).

This article's core aims are: (1), to present an outline of key 'schools of thought' and theoretical perspectives on technological change which informs a new technology futures framework; and, (2), to show how this framework could be used to quickly conceptualise possible futures, in particular, Australia's potential internet futures. The article also addresses the need to move beyond the dualistic discussion of internet futures as either emancipatory or, alternatively, dystopian. We need to better recognise and consider the diverse mixture of positive and negative outcomes the internet will more plausibly be associated with. As Voros observed, "we can – if we are wise enough – choose the quality of our mental models and guiding images of the future and, therefore, the quality of the decisions we make based upon them" (Voros, 2006). We agree: such 'guiding images' are too often taken-for-granted.

The paper is structured as follows. We first outline recent perspectives on internet futures. A review of relevant visions and technological change theory is synthesised as a new technological futures framework. Through 'incasting' we use this framework to consider the potential for alternative internet futures to emerge in Australia, focusing on the National Broadband Network (NBN) and the 2020 outlook.

Current Schools of Thought and Technological Frames

Schools of thought

The Smart Internet Technology CRC's report *Smart Internet 2010* articulated four schools of thought about possible internet futures (Barr, Burns, & Sharp, 2005). The four 'schools' were *Rich Media*, *Adaptive User Environments*, *Not the Smart Internet* and *Chaos Rules*. Each school encompassed an image of the future, theoretical perspectives, and thought leaders. Each school "ought to be viewed as... shared mind-sets" which "suggest possible future outcomes" (Barr, Burns, & Sharp, 2005, p.7).

Rich Media was the default future: the "multi-person, multi-device" access envisioned by Microsoft, News Corporation, Nokia and other corporations. This view anticipated debates about Australia's development of the NBN; rural-based tele-medicine infrastructure; consumer booms in high-definition television, and the Australian Government's Digital Education Revolution. This 'school' is "closely related to ... advocates of the pervasive computing approach" (Barr, Burns, & Sharp, 2005, p.41). *Adaptive User Environments* emphasised end-user experience, adaptability, and design, like Apple's iPod, iPhone and iPad, and how "social and cultural factors influence the way end users and consumers interact with a wide range of Internet-based technologies and services" (Barr, Burns, & Sharp, 2005, p.24). *Not the Smart Internet* emphasised "basic services for all" and "open standards". *Chaos Rules* was pessimistic

and slightly dystopian, questioning the robustness of Internet services (e.g. due to hackers, viruses, and cyber-warfare) and over-reliance on information technology. This school anticipated concerns about digital technologies and social media impacts on brain function, attention spans and society (Watson, 2010). *Chaos Rules* also foreshadowed Taleb's (2007) contrarian thinking on low-probability, high-impact 'Black Swan' events.

Today's dominant frames: 'Web 2.0', 'Web 3.0', and 'the Cloud'

A technological frame structures interactions among relevant social groups via the set of meanings attached to a technology/artifact (Bjiker, 1995). Publisher Tim O'Reilly's (2005) Web 2.0 is currently the dominant internet frame. After the 2000 dotcom crash, most internet companies struggled to raise finance and survive. Dotcom era visions such as convergence and disintermediation seemed dead. O'Reilly's Web 2.0 contended the next generation of web tools would be more accessible and end-user friendly, and be associated with collective intelligence, participation, and service delivery. This coincided with Google's initial public offering and the emergence of social networks like Facebook. The frame also co-opted the UK Blair Government's promotion of creative industries and the maturation of knowledge management (Leadbeater, 2009; Tapscott & Williams, 2010). Web 2.0 shapes current policy agendas such as 'Government 2.0' and 'e-Health'.

Thought leaders now increasingly discuss Web 3.0 which Web 2.0 might evolve into. Web 3.0 might include the mainstreaming of sophisticated, mobile internet-connected devices, greater video content, 'cloud' computing, 'the internet of things' (physical objects are also connected to the internet such as cars, home appliances, buildings), and a broader convergence of digital and physical worlds. Kevin Kelly (2011) defines this frame with six verbs: screening (not reading), interacting ("if it's not interacting, it doesn't work"), sharing, flowing, accessing, and generating. An emerging theme is collecting and using personal data. Data is 'the new oil': offering a new wave of value creation potential "in a world where nearly everyone and everything are connected in real time", despite privacy and trust concerns (World Economic Forum, 2011, p.5). The end-user remains central and is part of wider 'data ecosystems' which can be 'mined' to deliver more personalised services. Information and communication technology (ICT) will be a ubiquitous, intrinsic part of all social behaviours, business practices and government (Greenhill, 2011). The 'cloud' – a metaphor for resources accessible on-demand (e.g. software, content) from anywhere via remote internet-accessible storage – and associated 'cloud computing' models is a front-runner for such as paradigm shift.

The 'cloud' and 'internet of things' relate to emerging agendas for 'smart' and 'embedded' systems. Through 'intelligent' infrastructure and devices, data gathering and management will become infused into service delivery and everyday objects. IBM's former chief executive officer Samuel Palmisano (2008; 2010) believes computing power will be "delivered in forms so small, abundant and inexpensive" that it is "put into things no one would recognize as computers: cars, appliances, roadways and rail lines, power grids, clothes; across processes and global supply chains; and even in natural systems, such as agriculture and waterways." Further, 'systems of systems' will turn a mass of data into information and insight, to enable smarter healthcare, more efficient energy systems and productivity improvements (Palmisano, 2010; Rueda-Sabater & Garrity, 2011).

However, Web 2.0 and Web 3.0 are uncertain. Google, Facebook, Twitter, and Wikipedia have led to ‘lock-in’ and institutional capture of specific services. Paradoxically, this may limit future innovation. Disruptive challengers may emerge from China and India. Emerging internet communities in developing countries appear to adopt different attitudes and online behaviours which may become more influential (Dutta et al., 2011). A second view considers increasing user concerns about online privacy, identity theft, and changing public attitudes in Western markets. Dutta et al.’s (2011, p.9) international user study also found users “want it all: they desire freedom of expression, privacy, trust, and security without viewing these as mutually exclusive.” However, trade-offs between these potentially conflicting priorities may in fact be necessary. We need to think about futures in which people, in effect, ‘trade’ aspects of their privacy in return for other benefits. A final view is that most Web 2.0/ Web3.0 firms are yet to develop sustainable business models beyond start-ups. These perspectives foreshadow alternative futures.

Considering Alternative Technological and Internet Potentials

In this section we outline five *generic* images for technological futures, based on a review of different perspectives (such as those described above), technological change theory, and innovation theory. This framework can be used to consider potential internet futures.

Promised future (Dominant expectation[s] and vision[s])

The first category is the simplest to describe and identify. ‘Promises’ are made by actors seeking to build support for particular domains – such as those made by thought leaders about ‘Web 3.0’, the ‘internet of things’, and social media. Theoretically, the Sociology of Expectations (SoE) informs this category (Borup et al., 2006; Brown et al., 2000). SoE scholars suggest that expectations of technologies and their impacts/potential strongly influence the technological development and innovation, such as through ‘self-fulfilling prophecies’ (as seen with Moore’s Law). The more successful a particular ‘expectation’, i.e. the more support it has gained, the more likely key actors are to act in ways that help make it a future reality. Foresight analysts can proactively monitor this process and its outcomes.

Shared expectations can play necessary, central roles in creating momentum and stimulating coordination of heterogeneous actors. The Australian Government’s National Broadband Network – discussed in Section 4 – and the European Commission’s new ‘Digital Agenda’ for Europe, illustrate this. Alternatively, they can be problematic if widely accepted expectations (such as the default *Rich Media* ‘school’ or Web 2.0) remain uncritically accepted. Further, a dominant vision may exclude other possible internet futures from being considered by business and government, just as a dominant ‘official future’ can limit thinking in organisations.

Social/Speculative bubble(s)

Bubbles refer to a “heightened state of speculative fervour” that emerges in markets which, ultimately, result in investment failures and drastic, sudden market corrections (Shiller, 2005). In technological change, ‘hype cycles’ are similarly quite common (Finn & Raskino, 2008). These are often due to over-promising by promotional actors who are seeking resources (Geels & Smit, 2000). Additionally, greater social focus on a

dominant 'frame' can emerge as actors become 'enrolled' (Bijker, 1995).

Some theorists see bubble creation as a natural, necessary part of major technological change. The innovation theory of social bubbles argues collective *over-enthusiasm* and commitments beyond what would be rationalised by cost-benefit analyses, fuelled by hype, is necessary to enable action in the presence of risk and uncertainty (Gisler et al., 2011; Gisler & Sornette, 2009). Perez's (2002; 2010) technological revolutions theory further contends that a recurring sequence of events occurs during each revolution, each time taking between 40-60 years: an initial 'installation phase' (e.g. investments in new supporting infrastructure) first, leading to speculative bubbles and a dramatic turning point, and followed a 'deployment period' heralding a new 'golden age'. Similarly, Kondratieff-like 'long waves' are advanced (Freeman & Louca, 2001). Perez argues we are at the 'turning point' in the middle of the ICT revolution, during which major bubbles are expected. According to Perez, a 'new age' requires a new mode of growth compatible with a new 'paradigm logic' (for the revolution), and institutional changes to create the conditions for this growth.

Web 2.0 has become the dominant 'frame' and recent investment growth illustrates this. Facebook had a more than four-fold increase in valuation as it prepared for an initial public offering (Ozanian, 2011). Microsoft purchased Skype for over 400 times its operating income (Anonymous, 2011). These dramatic changes create hype cycles (Finn & Raskino, 2008). Facebook co-founder Mark Zuckerberg remarked (from a *Rich Media* worldview): "if you look five years out, every industry is going to be rethought in a social way" (cited in Gelles, 2010). Brands rushing into social media view it "as the panacea to diminishing returns in traditional mass media" (Fournier & Avery, 2011). However, concerns over privacy and how greater marketing and advertising might affect social networks may 'pop' such a bubble and herald major shifts.

Web 2.0 may be a major speculative bubble like the 1995-2000 dotcom era (Hirschorn, 2007; Raznick, 2011; Vance, 2011; Wooldridge, 2010). As Hirschorn (2007) observed, "in the Web hype-o-sphere, things matter hugely until, very suddenly, they don't matter at all". He forecasts social media to be "only another in a long string of putatively disruptive, massively hyped technologies that prove just one more step in the long march." The propensity of internet discourses to naïve prophetic thinking, self-styled experts and exaggerated promises (Dublin, 1991) partly explains regular shifts from hype to disappointment.

Disruption/Chaos

Schumpeterian 'creative destruction' – the emergence, experimentation and innovation central to technological change and free markets – largely defines this image. 'Chaos' can also mean opportunity (as well as the danger normally perceived). Services originally designed to 'police' social networks have also led to new innovations in text mining and complex event processing (Sommon & Brown, 2011). 'Disruption' can be technological or driven by additional social or political factors. For example, a common pitfall in expectations of future technological developments is believing social practices "to remain constant in spite of the introduction of new technology (Geels & Smit, 2000, p.880).

Exponential growth in the miniaturisation of transistors and computer power (Moore's Law) may no longer hold in coming decade(s) and dramatically change chip fabrication costs (Rupp & Selberherr, 2011). Natural resource limits may disrupt consumer markets: the scarcity of needed rare earth elements in which China

controls 95% of global supply (Cohen, 2007). Additional emerging candidates for future disruption are ‘augmented reality’ technologies and ‘nano-electronics’. Early stage augmented reality prototypes and technologies are now being commercialised together with geo-location tools like Geoloqi.com, in which real-world environments are ‘augmented’ by sensory inputs received via technology (via smart phones). An alternative medium-term source of technological disruption is a major new means of chip fabrication and manufacturing. Most prevalent at present is ‘nano-electronics’, a major area of research in Australia and Asia-Pacific.

Unintended consequences

Unintended social consequences emerge from second-order and third-order effects of technologies along with the appropriation of technologies. Theorists show that technologies are often ‘appropriated’ by diverse end-user groups, typically for uses unforeseen by the technology creators (Burns & Eltham, 2009; Jamison & Hard, 2003). Cyberpunk author William Gibson similarly observed that “the street finds its own use for things.”

This category reveals a wide range of internet potentials and perspectives. ‘Cyber-realism’ is an emerging *Chaos Rules*-like philosophy that challenges the often utopian internet discourses (Morozov, 2011). Further convergence of digital and physical/social worlds will enable political and other interests to shape the digital world’s development and its use in unexpected ways (Kelly & Cook, 2011; Morozov, 2011). Recent literature suggests unintended consequences may include: information flows being distorted by personalisation features (Pariser, 2011); data security and privacy being compromised by the adoption of open/cloud computing architectures (Bisong & Rahman, 2011; Grobauer et al., 2011); authoritarian governments gaining power from the internet, rather than a power shift to individuals which is more commonly expected (Burns & Eltham, 2009; Morozov, 2011); and the potential for intensified consumerism as more sophisticated ways to advertise and sell become embedded in more online and social technologies. The “open platform paradigm” of *Not the Smart Internet* can also, paradoxically, compromise content creation and intellectual property (Lanier, 2010).

The spectre of increasing cyber-warfare is a topical national security issue and regional flashpoint (Clarke & Nake, 2010). For example, China is blamed for attacks on the ICT systems of Australian mining and resource firms (Wilkinson, 2010). In the Asia-Pacific region, many countries have invested in new national teams and defensive cyber-warfare capabilities. Several different possibilities exist about how cyber-warfare could evolve. Attacks on transnational firms may impact the stability of sovereign financial markets. Countries may develop offensive cyber-warfare capabilities and teams as a form of market intelligence, and as strategies to gain access to intellectual property.

Co-existence/Co-option

Co-existence/Co-option focusses on the complex ‘co-evolution’ of technology and society. This co-evolution makes unpredicted futures more likely than is commonly recognised despite our best efforts to achieve foresight (Williams, 2006). Through ‘co-evolution’ one possibility is the complex co-existence of old and new technologies (Geels & Smit, 2000). This is an important counter-point to common forecasts in which the new *replaces* or *displaces* the old. Co-existence/Co-option also recognises

that business entrepreneurs and experts often articulate and promote futures they have a vested interest in. SoE scholars in the Science and Technologies Studies field emphasise attempts “to create ‘direction’ or convince others of ‘what the future will bring’” (Brown et al., 2000, p.4). Here, ‘contested futures’ is relevant. Brown et al (2000, p.3-4) observe that “if actors are to secure successfully for themselves a specific kind of future then they must engage in a range of rhetorical, organisational and material activities through which the future might be able to be ‘colonised’.”

These actor strategies may also partly explain how Web 2.0 versions of *Rich Media* and *Adaptive User Environments* quickly came to dominate thinking. Web 2.0 growth and social networks provide emancipatory tools for many, yet have also enriched key individuals like Facebook’s Mark Zuckerberg, Mahalo’s Jason Calacanis, publishers John Battelle and Tim O’Reilly and LinkedIn founder Reid Hoffman. However, the broader community of ‘Web 2.0’ proponents and consultants rarely consider the possibility that they may be acting on what Inayatullah (2008, p.5) terms “used futures”: out-dated conceptions of the future “unconsciously borrowed from someone else.” Additionally, the increasing number of proposals to ‘order’ or (re)structure the evolution of the internet and mobile markets is a clear manifestation of the ongoing ‘co-evolution’ of technology and society which continually plays out. These proposals include the ‘network neutrality’ debate, and United States legislation such as the Stop Online Piracy Act, and the Research Works Act that would restrict ‘open access’ publishing. These regulatory regimes can reshape industry trajectories and change the balance of power between innovators, early adopters and laggards (Lessig, 2001; Spar, 2001; Wu, 2010).

The above categories, and illustrative ICT examples, are summarised below in Table 1.

Table 1. *Technology futures framework: Five generic images*

Category	Definition	Theoretical perspectives	Illustrative ICT example(s)
<i>Promised Future(s)</i>	Future(s) commonly articulated by influential actors/players.	<ul style="list-style-type: none"> •Social dynamics of expectations •‘Technological frames’; coordination around shared visions 	<ul style="list-style-type: none"> •‘Web 2.0’/‘Web 3.0’ • ‘The Internet of things’
<i>Social / Speculative Bubble(s)</i>	Hyping of image(s) leading to widespread over-speculation on near/ medium-term futures.	<ul style="list-style-type: none"> •Hype-disappointment cycles •‘Social bubble’ innovation theory •Economic dynamics/patterns in major technological changes 	<ul style="list-style-type: none"> • ‘Dot com bubble 2.0’ (focussed on social media and social networks)
<i>Disruption/ Chaos</i>	Innovation unleashing rapid change, growth (and potentially also imperilling the internet)	<ul style="list-style-type: none"> •Creative destruction (Schumpeterian) •Unpredictable user-driven changes •‘Black Swan’/rare events 	<ul style="list-style-type: none"> •SMS, micro-blogging •Reduced trust in online due to cyber-crime
<i>Unintended consequences</i>	Unplanned second- and third-order consequences; emergence of unexpected uses.	<ul style="list-style-type: none"> •Appropriation of technology •‘Janus face’ of technology (creating new opportunities <i>and</i> problems) •Understanding technologies as social constructions: shaped by contexts 	<ul style="list-style-type: none"> •Information overload and related syndromes •Use of social networks for political purposes •Security implications
<i>Co-existence/ Co-option</i>	Incorporating new technologies in existing systems (rather than transformation change); the ‘co-existence’ of old and new.	<ul style="list-style-type: none"> •‘Co-evolution’ of technology and society; technology dynamics theory •Societal barriers to the diffusion of technologies (e.g. cultural barriers) 	<ul style="list-style-type: none"> •Response of White House to Wikileaks (changing diplomatic cables)

Case Study: Australia's Potential Internet Futures

In this section we focus on the Australian context: the National Broadband Network (NBN) which is being rolled-out by the Federal Government. If it is fully rolled out (the Federal Opposition currently opposes this), the high speed network of three technologies (optic fibre, fixed wireless, satellite) will be completed in approximately 2020.¹ We first introduce the NBN. Issues and potential futures are then discussed, considering the analytical perspectives advanced.

The national broadband network

An NBN was first proposed by Australia's Howard Liberal Government in 2003 and eventually made a Federal election issue in 2007. The then Rudd Labor Government announced in April 2009 that it would form the NBN Co, a wholly-owned Commonwealth company, to build and operate a national "wholesale-only, open access broadband network." The successor Gillard Labor Government started to roll-out in 2011. The Federal Government's decision to create the new network followed almost a decade of unsuccessful attempts to build an NBN-like network. Sol Trujillo-era Telstra adopted lobbying tactics to delay the separation of its retail and wholesale divisions. Competitors like Optus lobbied against Telstra to avoid hidden network and sunk costs. A competitive bargaining game developed. Research and development firms like Telstra Research Labs and the Smart Internet Technology CRC led supply-side research on NBN-like application scenarios and use cases.

The NBN was the Australian Government's response to telecommunications market failures. The Smart Internet Technology CRC highlighted early-stage innovators and commercialisation possibilities. However, gaps in the Australian environment, such as the lack of a venture capital sector, hampered efforts. NBN Co's formation shifted the debate to access and pricing regimes, location of testing sites, and the reaction of market incumbent Telstra. New debates also focus on government and capital markets execution. NBN Co faced scrutiny about its operational efficiencies (in 2011 the pricing regime was revealed to be more expensive than first planned), ability to roll-out the network, and the management team.

Analysis: Schools of thought and alternative futures

The default future in the 'schools of thought' framework is *Rich Media*. This 'school' may have captured Australian Government policy-making and academic research as the dominant technological frame that actors have been enrolled in (Bjiker, 1995). NBN evidences the role of shared expectations in creating sufficient momentum and stimulating coordination: all actors speak of the same "digital economy of the future" and of its emancipatory, economic potential. The NBN is a return to the 1990s rhetoric of the internet as an 'information superhighway' in a new guise. Similar claims to NBN's emancipatory potential were made for Sausage Software during the Netscape-Microsoft browser wars (in the mid-late 1990s) and for local content production for the 2G and 3G mobile internet.

The *Not the Smart Internet* 'school' would suggest an NBN framed as an important intervention that *primarily* addresses access and digital divide issues, and provides more widespread, functional, lower-cost, transparent services. However, this contrasts with *Rich Media* style focus on network speed and capacity for media streaming and future 'cloud' based businesses. The *Adaptive User Environments* 'school' suggests

emulating, locally, Apple or Google-like models of content creation and distribution. Australian retailers such as JB Hi-Fi might develop new online content service-orientated models (e.g. streaming music services like Pandora). However, these firms must successfully compete with global competitors to win customers (Stafford, 2011). NBN may provide the infrastructure for virtual worlds to have more significant uptake (Salomon, 2010). The *Chaos Rules* 'school' suggests security capabilities to pre-empt hackers, viruses, and cyber-warfare.

Alternative futures framework: Considering image categories

In this section we provide a *high-level* 'incast' of Australian internet futures, considering a 2020 time horizon. Incasting involves considering predetermined images of the future in order to deduce alternative future scenarios for the particular object of the research (Del Pino, 1998). The advantage of this approach is that it enables quickly conceptualising alternative futures (Dator, 2002).

Promised future

The 'promises' and dominant expectations for Australian internet futures are clearly expressed in the Government's (2011) National Digital Economy Strategy (NDES) which articulates a vision for Australia to be, by 2020, a 'world leading digital economy'. Eight goals are defined:

- By 2020, Australia will rank in the top five OECD countries for the portion of households that connect to broadband at home;
- By 2020, Australia will rank in the top five OECD countries for the portion of businesses and not-for-profit organisations using online opportunities;
- By 2020, the majority of Australian households, businesses and other organisations will have access to smart technology to better manage their energy use;
- Improved health and aged care: by 2020 90 per cent of high priority consumers (e.g. older Australians, those with a chronic disease) can access individual electronic health records; by 2015 495,000 telehealth consultations will have been delivered by remote specialists; by 2020, 25 per cent of all specialists will be participating in delivering telehealth consultations;
- Expanded online education;
- By 2020 at least doubling the level of teleworking (at least 12 per cent of Australian employees);
- By 2020, four out of five Australians will choose to engage with the government through the internet or other type of online service; and
- By 2020, the gap between households and businesses in capital cities and those in regional areas will have narrowed significantly.

The NDES envisages a 'market-led' transition to this future economy, connecting activities to the 'smart systems' vision (e.g. using ICT to optimise energy and transportation systems) "enabled by... the internet, mobile and sensor networks" (p.12). A 'linear' view, similar to *Rich Media* and *Adaptive User Environments*, is adopted: "based on existing trends, in the future the online experience will become richer and more data intensive and increasingly integrated into everyday life, at home and at work" (p.10). Inclusions themes, of *Not the Smart Internet*, are also noted: "distance - once a defining characteristic and barrier for regional Australia - becomes increasingly

irrelevant” (www.nbn.gov.au).

Social/Speculative bubble

The NBN and NDES were developed during intensifying Web 2.0/Web3.0 hype. An alternative image centres on the potential for unmet expectations, and the associated ‘fall-out’. This would replay aspects of the 1995-2000 dotcom bubble – especially if the current “state of speculative fervor” (Shiller, 2005) surrounding Web 2.0 contracts in the near-to-medium-term. The envisaged application scenarios and use cases may also not be commercially and/or socially viable. An important example is ‘e-health’ for aged Australians. Australia has to-date struggled to develop viable new e-health businesses/business models for providing aged care, and public acceptance issues could also slow adoption (Tegart, 2010). Similarly, teleworking has tended to not meet expectations (Geels & Smit, 2000) due to unmet social needs which could reoccur over the next decade. In this future, when 2020 arrives the economic productivity ‘promise’ of NBN is unrealised.² Moreover, it raises the possibility – if user take-up is lower than expected, as recently occurred in the UK – of delays in NBN Co gaining sufficient cash-flow to no longer require government support.

Some Australian social scientists have argued – in part due to highly differential take-up across NBN test sites – that the ‘promises’ (above) will be challenged by local cultural and material factors, and that such variations will *grow* in significance as the NBN is *further* rolled-out (Apperley et al., 2011). Both localised conditions (e.g. installation policy and logistics, costs) and “integration of the NBN with each household’s domestic network of hardware devices, internal connections, software, and of course skill and interest” must be considered (Apperley et al., 2011). Like the recent example of the Human Genome Project (Gisler et al., 2011) it may take many decades to fully “exploit the fruits” of the NBN investment, rather than the shorter time horizons presently expected.

Disruption/Chaos

This image highlights the ‘creative destruction’ associated with technological change and associated potential for *unanticipated* shifts in practices. *If* optical fibre overtakes DSL broadband connections after 2015/6 (assuming full roll-out continues)³ then many sectors are likely to be ‘ripe’ for disruption – such as media, telecommunications, advertising, and retail – as people invent ways to utilise the expansion in bandwidth *and* evolve offline behaviours. Implicit in the NBN is a vision of a “digital home” and “an anticipated future of digital living” (Apperley et al., 2011) which many may embrace, whilst others ‘opt-out’ of the “connectopia” (Kiss, 2011). Similarly, broadband services (see generic categories in Table 2), and the NBN, need to be viewed more broadly than as merely high-speed Internet.

Table 2. *Three generic categories of broadband services (adapted from Barr, 2010)*

Category	Services
<i>Unmanaged services</i>	<ul style="list-style-type: none"> • Open Internet
<i>Managed services</i> (additional tiered services from broadband providers)	<ul style="list-style-type: none"> • Closed systems charged as fee-for-service (e.g. due to content packages of movies, sports, news and current affairs) • Internet Protocol Television (IPTV) services: “commercial, linear, premium TV streams” that can be delivered over NBN (100 Mbps). NOTE: NBN proposes a ‘multicast’ capability “designed to enable service providers to deliver high-quality video over the fibre footprint” (NBN Co Limited). • IP telephony
<i>Publicly supported services</i>	<ul style="list-style-type: none"> • Services not yet be commonly available on open Internet and also unlikely initially to be part of managed services (e.g. due to perceived unprofitability) • New initiatives in e-health, e-government and education

By 2020, internet futures could have a majorly disruptive impact on several sectors. Today’s decline in newspapers and some retail sectors (e.g. music, books), could signal futures in which many local firms are unable to maintain viable, growing businesses. Local players such as those experimenting with new service-oriented models, such as JB Hi-Fi, increasingly face *global* competition and disruption potential. Regulators and users may also still be “struggling to work out the boundaries of online privacy” (Gettler, 2010) as practices, tools, and norms evolve.

Unintended consequences

NBN has the potential to generate a multitude of unintended social consequences – both positive and negative (often depending on whose perspective is taken). NBN uptake may vary by geographic areas, leading to new subtle versions of the ‘digital divide’. Related socio-technical factors influence access to participation in a digital economy. The ‘unintended consequences’ image also alludes to the potential for arbitrage and leaking of NBN data to individuals. Although the ‘Gov 2.0’ agenda views the open data movement positively, Australia is constrained by the Westminster system which presently imposes limits on the release of government data. Major unintended consequences for the Australian political system could emerge in a more technologically-empowered society – a potential blind-spot for politicians, regulators, policymakers, and others. The internet can also facilitate larger-scale manipulation of publics (Kearne, 2012), a concerning trend the NBN may also enable.

Co-existence/Co-option

In another plausible scenario a “patchwork of [variable] connectivity” prevents the envisaged future, centred on the digital home being “integrated into the digital economy as a node of production and consumption” (Apperley et al., 2011), from fully emerging. The ‘co-existence’/‘co-option’ image further suggests potential internet futures in which highly advanced digital homes co-exist with less advanced and connected homes with varying connections, mediums, and social conditions – rather than a homogenous new ‘digital Australia’. In this future official projections of 70 percent take-up by 2025 are not achieved. Political risks provide another avenue to such futures, with a partially complete NBN (if there is a change of Federal government) likely co-existing with

other networks.

Additionally, a range of social, competitive, and regulatory issues highlight the potential for 'co-option'. Regulatory settings and markets factors will influence the level of competition and services that emerge. NBN might fit Perez's Kondratieff-like 'long waves' model but its roll-out has been delayed by local factors such as bargaining games, telecommunications market failure and institutional issues. The NBN Co's government monopsony also limits capital markets involvement and, consequently, a true valuation market. Small and medium enterprises who develop new NBN markets or information services may in time be forced to start mergers and acquisitions that, ultimately, favour larger incumbents. These factors could limit the NBN and Australia's internet futures. Furthermore, NBN's growth is in a democratic society which means it will be different to the Confucian and Juche logics of Singapore and South Korean NBN-like solutions. Whilst the Sociology of Expectations suggests policymakers, academics and others and will continue to envision NBN-like (digital economy) capabilities, there is the risk of coordination failure, roll-out problems, and, possibly, colonised futures (Brown et al., 2000).

Discussion

Whilst the above analysis is only a high-level assessment it suggests discussion in Australia of potential internet futures is dominated by a limited number of 'schools' and 'image' categories. Our reading of the current NBN debates and consideration of potential internet futures is there is little consideration of the *Chaos Rules*, nor the potential for 'bubbles' (and for associated unrealistic expectations), unfolding 'disruption', unintended consequences, or co-existence/co-option. The NDES fails to address the potential for sectoral disruptions, and associated indirect negative effects. Holistic consideration of potential futures and associated outcomes could better inform planning and decision-making.

Methodological and conceptual improvements could be made by using other futures tools and exploring interconnections. Examination of potential second-order and third-order consequences could be improved by using 'Futures Wheels'. Interconnections appear to exist, for example, between 'bubbles' and 'unintended consequences'. If the Government and NBN Co – through the return to 1990s utopian internet rhetoric – contribute to speculative bubbles emerging, then this may have social consequences that unintentionally later impair the envisioned digital future and current 'real' economy. Furthermore, a major "social bubble" may be *necessary* to mobilise the needed commitments and major investments by innovators and entrepreneurs to realise the 'promises' and cause 'disruptions' (Gisler et al., 2011).

Conclusion

In this paper we have outlined and considered key 'schools of thought' (or mental models) on internet futures and additional analytical and theoretical perspectives that provide insights into potential internet futures – both internationally and in Australia. Through a brief case study, we have shown how a resulting technological futures framework could be used to quickly highlight potential futures through a deductive 'incasting' process. We make several contributions to the literature on internet futures and technology foresight. First, we built on the *Smart Internet 2010* project (Barr, Burns, & Sharp, 2005) and its four 'schools of thought'. We have updated examples

to include contemporary debates. The current dominant ‘frames’ are understandable as expressions of the default ‘mental model’ on internet futures, *Rich Media*, along with *Adaptive User Environments*, which also informed development of the NBN.

Second, through literature review we identified five image categories which can be used as predetermined images of the future for incasting. The first three images – promised futures, social/speculative bubbles, and disruption/chaos – deal primarily with change dynamics. The last two images – unintended consequences, co-existence/co-option – primarily bring out potential outcomes such as regarding competition and interest politics, risk, and social impacts. Analyst consideration of the categories enables asking “devil’s advocate” questions (Wright & Cairns, 2011; Taleb, 2007) which challenges dominant ‘frames’ and stimulates consideration of multiple viewpoints which is needed for effective scenario thinking. Like *Smart Internet 2010*’s schools of thought, these predetermined images are relatively open-ended and can be revised with future examples, along with analysis of other domains.

Each school of thought and image category provides important perspectives for analysing the emergence of the NBN and potential Australian internet futures. Widely accepted expectations inform the application scenarios, use cases and supply-side research supporting the NBN and similar technology debates. The NBN is in some ways a return to the past, reminiscent of the ‘information superhighway’ rhetoric in the 1990s. What the incasting exercise reveals, however, is that a more plausible *mixture* of outcomes should be considered by planners and strategists in Australian internet future scenarios along with a broader move beyond dualistic discussion of internet futures (either utopian emancipatory or dystopian). Broader perspectives could consider critical analysis of Web 2.0 and global internet futures (Lessig, 2001; Lanier, 2010; Morozov, 2011) and integrate this with critical futures studies perspectives.

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Notes

- 1 These conflicting political positions present important political risks. This is particularly true if the Opposition Liberal Party wins the *next* Federal election scheduled for 2013. It is likely to be more difficult for a Liberal Federal Government

- to discontinue/dismantle the NBN if it is elected in 2017 (the subsequent Federal). If fully rolled-out the NBN will “connect 93% of homes, schools and workplaces with optical fibre (fibre to the premises or ‘FTTP’)” and “for the remaining 7% we will connect to our next generation fixed wireless and satellite”.
- 2 Australia is a small market which raises the potential for various market failures and associated uncertainties about the how many players can be supported in some sectors (Stafford, 2011).
 - 3 As per the market forecasts and analysis of Telsyte (<http://www.telsyte.com.au>).

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