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1. Introduction

Notions about *innovation* have been essentially been ignored during the debates about Australia's National Broadband Network (NBN) project.

This paper draws upon the work of two established theorists on innovation, Joseph A Schumpeter and Clayton Christensen (each from a different era and holding a differing perspective on innovation), to canvass issues about the possible forms of applications and services that might find places in a new communications environment, and might facilitate institutional changes with NBN in the next decade.

Joseph A Schumpeter (1883–1950) was a prolific academic author in his twenties, Austria's finance minister in his thirty's, and later a banker who made a fortune then lost it in a stock market crash, only to re-invent himself to become a world famous Harvard University Professor of Economics. In 1983, *Forbes Magazine* christened Joseph A Schumpeter the 'prophet of innovation', and the world's 'best navigator' through turbulent times. His biographer, Thomas McCraw (2007), wrote that Schumpeter understood better than anyone, (including Schumpeter's arch rival, John Maynard Keynes), 'the bedrock economic principle that destruction of business, fortunes, products, and careers is the price of progress toward a better material life'. According to Schumpeter, nearly all businesses eventually fail as victims of innovation to their competitors, but the general prosperity created by this 'capitalist engine' far outweighed the wreckage it left behind.

His catch phrase, first used in 1942, was that real innovation was driven by 'creative destruction' where innovative capitalistic products and methods displace older ones. In his seminal work, *The Theory of Economic Development* (1934: 66), Schumpeter specified five types of innovation that defined the entrepreneurial act:

- (a) The introduction of a new good — that is one with which consumers are not yet familiar — or of a new quality of a good.
- (b) The introduction of a new method of production — that is, one not yet tested by experience in the branch of manufacture concerned.
- (c) The opening of a new market, that is a market into which the particular branch of manufacture in question has not previously entered, whether or not this market has existed before.
- (d) The conquest of a new source of supply of raw materials or half manufactured goods again irrespective of whether this source already exists or whether it first has to be created.
- (e) The carrying out of the new organisation of any industry, like the creation of a monopoly position ... or the breaking up of a monopoly position.

The last of these points is the most apposite to NBN. Several decades later another Harvard luminary, Clayton Christensen, Professor of Business Administration at the Harvard Business School, wrote about the notion of 'disruptive technologies' with work that was more applied to the field of communications than Schumpeter's all embracing discourse. Clayton Christensen's *The Innovator's Dilemma*, first published in 1997, was also regarded as groundbreaking work about technology and entrepreneurship. He argued for new ways of looking at innovative companies that had created new business models with the effect of eventually changing the economics of their industry through the introduction of particular kinds of new technologies.

Christensen drew a distinction between two major types of technologies. For him, each type of technology had contrasting characteristics that facilitated different kinds of change. He labelled his first type as ‘sustaining’ technologies, because although these were new technologies they essentially only improved performance in ways that mainstream customers in major markets had valued. The customers of sustaining technologies recognised that although there was product improvement, the technology was essentially offering the same thing as before. Consequently the tendency was for more products to emerge every year or so incorporating new features, but within an existing technological framework, such as the 1992 Microsoft Word offering which had 311 commands — part of what was called ‘featuritis’. So it was functional change, but no real innovation.

The second type of technological category defined by Christensen was ‘disruptive’ technologies, so named because they had the effect of completely undermining established business practices. These were technologies that initially offer little in the way of enhanced performance but generally appealed to consumers because of their convenience and cheapness. As Christensen explained in an interview:

A disruptive technology is a new product or service that isn’t as good as your product line; therefore it doesn’t appeal to your best customers. Typically it’s technologically simple. Often it’s more convenient to use. But it’s less expensive, and you make gross margin dollars per unit sold. So it’s a discontinuous improvement in technology. It’s something cheaper, simpler and often smaller. (Christensen 2001)

Disruptive technologies can eventually ‘steal’ secure, low end, low margin markets from incumbent players. Whereas sustaining technologies foster improved product performance, disruptive technologies initially tend to degrade product performance but in the long term often realise great potential. In some instances, Christensen notes, the adoption of new technologies have often driven established companies out of business even though these companies ‘appear to have been doing everything right’. According to Christensen, Thomas, and Hart:

The leading companies in such industries are so focused on sustaining innovations and addressing the more sophisticated and profitable customers that they ignore the disruptive innovators piercing into the market from the low end. In this way, disruptive technologies have plunged many of history’s best companies into crisis and, ultimately, failure. (2001: 82)

According to Christensen (1997: 69) disruptive technologies have four common characteristics. They:

- (a) Enter niche markets that are often initially dismissed by the mainstream players as merely inferior products or services;
- (b) Introduce new customers who may differ completely from the existing customers of the old sustaining technology;
- (c) Tend to increase their sales before the mainstream players react; and,
- (d) Improve at a faster rate than sustaining technologies to such a level that they eventually replace or significantly diminish the latter’s presence in the mainstream market and occupy new ground which is larger than the market share for the old technology.

Table 1: Examples of disruptive technologies in the ICT industries

New technology	Old technology	Potential advantage	Disruptive nature
Transistor radios	Vacuum tubes	Smaller, cheaper	Poor sound quality
Transistor TV's	Vacuum tubes	Cheaper, more reliable	Low voltages and small sizes
Smaller disc drives	Larger disc drives	Smaller, cheaper, more reliable	Less memory capacity
Mini-computers	Mainframes	Cheaper, easier to modify	Less processing capability
PCs	Mini computers	Smaller and cheaper	Poor processing capability
PDA's	PCs	Smaller and cheaper	Poor processing and input-output capability
PC Internet	Print media	Greater richness, reach	Initially low richness
Mobile Internet	Fixed line Internet	Portability	Small size

Source: Funk (2004: 5)

We are now seeing not only the emergence of many more new individual technologies that re-align market shares for particular companies, but innovations that also create new business models and alter the economics of their industry. While Christensen's work essentially focused on case studies, his notion of disruptiveness could be extended into wider examination of marketplace structural disruption. Manifestations of this include: amazon.com — billing itself as 'world's biggest book store' — as disruptive to traditional bookstores, busy auction sites such as eBay disrupting auction houses, airlines that now process their ticketing online which undermining established travel agents. The introduction of Voice over Internet Protocol (VoIP) services were widely perceived as having considerable disruptive potential to established telecommunications carriers. Briefly though the pattern of change is not inevitably finite destruction. Many online share traders, for instance, have re-intermediated (not lost their established role as 'middle' men/people), and generally re-energized their businesses, as a result of Internet based share trading practices. The established music industry has been highly adaptive too in recent years with the popularity of Internet downloading and peer-to-peer music file sharing. So how might such notions of 'disruption' be applied to NBN?

2 Institutional disruption: NBN Co overview

The National Broadband Network (NBN), announced by then Labor Prime Minister, Kevin Rudd, in April 2009, promised a new national fibre to the premises network, designed to connect 90% of Australian homes, schools, and work places with speeds of 100 Mbps. A new company, NBN Co, with majority government ownership (51%) and 49% private sector ownership, was expected to have an estimated investment total of \$43 billion over eight years to build the NBN. The intention was that NBN Co would divest its interest within five years after the end of the roll out, but the Greens party (with the balance of power in the Senate after July 2011) announced their intention to opt for continuation of full public ownership of NBN Co.

Some complex policy assumptions underpinned this major announcement of the largest and boldest infrastructure project in Australia's history. Primarily, the alleged general failure of open competition policy in Australian telecommunications, introduced in July 1997, and the subsequent lack of significant new major capital network investment (except by Optus), was seen by policy makers as a problem that needed to be addressed. The general industry demand — by virtually all of

Telstra's competitors — strongly expressed to the NBN Senate Select committee on the National Broadband Network (2009) was a perceived need for the structural separation of Telstra between their network and services divisions. It was partly in response to the alleged continuing market dominance of Telstra that the Labor government decided to create a new network fibre-based wholesale only broadband company. The legislation before the Parliament at the time of writing states in part:

The Minister may exempt Telstra from the requirement to have an undertaking about hybrid fibre-coaxial networks or subscription television licences if the Minister is satisfied that Telstra's undertaking about structural separation is sufficient to address the concern about the degree of Telstra's power in telecommunications markets. (Telecommunications Legislation Bill 2009, part 33, Division 1)

On 20 June 2010, after almost a year of tortuous negotiation between the Rudd Commonwealth government, NBN Co and Telstra, a non-binding financial heads of agreement was signed by the parties. Two key points are noteworthy here. First, if this agreement is eventually implemented, NBN Co's access to Telstra's infrastructure should lead to the avoidance of network duplication and accelerate NBN's roll out. Second, Telstra will be paid an estimated \$9 billion to progressively transfer its voice and broadband customers from its copper networks to NBN Co's network — making Telstra NBN Co's biggest customer.

Central to the network design is the political necessity of NBN Co offering wholesale services only — and not being a service provider itself. In essence, NBN Co will provide a transport business for many different service providers via its wholesale access network. In this context NBN Co's architectural model is centred on Layer 2, a virtual LAN model with standard Ethernet services for others. NBN Co, in brief offers:

Layer 1: the backbone passive fibre network itself.

Layer 2: otherwise known as the link or active layer — involves the provision of the passive fibre, *plus* the active electronic components, to offer an Ethernet bitstream service to a Retail Service Provider (RSP), or to another wholesale operator.

Layer 3: RSPs, could also take a bitstream service and add layer 3 of IP services and applications to sell value-added products to end-user customers like internet, IPTV and VoIP (based on NBN Co, 25 March 2010).

Hence NBN Co will be a wholesale only company that is required to operate on an open access basis to organisations who want to supply retail services to customers. The legislation is designed to ensure that NBN Co will 'provide non-discriminatory and fair access to all wholesale customers' and that 'access to the National Broadband Network will be provided to all retailers on an equivalent basis' (NBN Regulatory Reform 2009).

So this bold Rudd government telecommunications policy reform has re-created a government funded telecommunications monopoly platform comparable to the Telecom/Telstra historical monopoly of the Customer Access Network (CAN), but now based on fibre rather than copper to the home. So does it represent a major factor in what Schumpeter termed 'the breaking up of a monopoly position'? The changes to competition policy during the 1990s need to be acknowledged first in response to this question. Briefly, the introduction of a fixed line duopoly between 1991 and 1997 (only Telecom and Optus), followed by the introduction of open competition policy from July 1, 1997 that allowed any virtually any competitor to have regulated access to Telecom's fixed network, inevitably impacted on Telecom's market dominance. In 2010, the first year of the operation of NBN Co, Telstra's competitive market share may be broadly speculated mainly upon annual company reports; PSTN 70%, Broadband 52%, Mobile 40%. So Telstra to some extent had lost its dominance before the onset of NBN Co — but still holds a commanding market position.

While all of this remains intensely political and highly fluid at the time of writing, it seems that devotees of Schumpeter would see this as a classic example of moving towards an end game of

‘creative disruption’ to the established market order. However, the big unknown — yet to emerge — is what future strategy Telstra will employ.

3. Disruptive FttP: The NBN user interface: Optical Network Termination (ONT) Units

The ways in which consumers will access NBN Co services in their homes represents a further manifestation of disruption to the present order. The NBN’s Optical Network Termination (ONT) Units are the technological key focal point as to how the range of services will be offered to consumers. They represent a locus of network and service authority in the NBN similar to that for set top boxes for delivering the new Freeview digital channels and the Foxtel IQ set top box for a subscription television service. Australia’s new digital world is likely to see a multiplicity of digital boxes emerge in the next few years, provided by different manufacturers, and likely to be followed by some inevitable rationalisation of players in the market place.

While this key NBN Co architectural policy is not yet entirely fixed at this stage, a number of implications for applications and service providers are clearly emerging as likely outcomes. In summary:

1. NBN Co will supply the point of interconnection at the residence to the network that will provide broadband capacity of up to 100 Mbps from the backhaul carrier.
2. NBN Co will only provide ONT Units to customers who have an agreement with a Retail Service Provider (RSP).
3. NBN Co will provide wholesale capacity to a range of service providers but it will not have individual customer accounts of its own. Consumer agreements can only be with an RSP.
4. NBN Co has proposed that an Analogue Telephone Adapter (ATA) will be ‘integrated’ within an ONT. NBN Co staff have given assurances that consumers who wish to remain with their basic telephony supplier will have guaranteed continuity of service quality with NBN, and presumably also TTY services for deaf people. Such assurances appear to have gained credibility with the 20 June 2010 in principle agreement between NBN Co and Telstra.
5. It will be possible for a consumer to sign up with one ISP who would supply all broadband services to the household for voice, video and Internet access — a version of the ‘triple play’ model employed throughout much of Europe. NBN Co’s ONT also makes it possible for multiple individual service providers to use these ports for just a particular single service. A common view in the service industry is that as consumers are unlikely to want to engage with, say, five different overall service providers (which the current architectural planning facilitates) and be billed by five different companies some aggregation model may emerge.
6. NBN Co will not automatically provide a capacity of 100 Mbps through its ONT units — this will depend in part on what capacity the service provider is prepared to buy from NBN Co and subsequently deliver to the consumer.

4. Disruption: video, commercial, and subscription television

The domain of new video and television applications and services is widely seen as having rich potential, but at different levels of commercial success. The most likely new managed entrant is for new Internet Protocol Television (IPTV) services to be introduced into Australia as a result of the NBN initiative. It is the view of this author, based upon field experiences, that IPTV currently has the largest body of prospective new service providers in NBN Co. This view is supported by several market analysts who regard Australian commercial television to be in a parlous state with its current record high level of financial gearing, and apparently with only a limited sense of innovation that might re-generate their business. It will also be intriguing to watch whether Telstra, which is facing a rapid decline on fixed line telephony revenues, and strong competition in the mobile market, will

move more strategically to become a Media Comm organisation with IPTV as integral to new business thinking.

There are many possibilities for major changes in the video, commercial, and subscription markets and six examples are canvassed here:

- New offerings by Internet Service Providers (ISPs) facilitated by NBN Co.
- New offerings by individual new Service Providers (SPs) facilitated by NBN Co.
- Small operator live-streaming businesses
- Monetisation of user-generated content
- Responses from incumbents, Telstra and Foxtel.
- Global market challenges via *Google*.

4.1 New offerings by Internet Service Providers (ISPs) facilitated by NBN Co.

An organisation such as Australia's third largest ISP, Perth-based iiNet, could continue to offer Internet, voice and video as 'triple play' services by buying capacity from NBN Co service — say 20 Mbps — and market its services to residential consumers. If households were in inner Perth then most likely the NBN interconnection would probably be direct to iiNet's own network; if households were in Brisbane then iiNet would most likely be dependent on a backhaul carrier, such as Telstra, but the service to the household would still be iiNet's via NBN Co.

IPTV services could also be offered through a subsidiary service agreement that iiNet has already struck with FetchTV, a 60% Australian owned / 40% Malaysian owned newcomer to the Australian television market. Fetch TV already has contracts with Fox International channels, MTV networks, BBC and NBC, Discovery Communications, and National Geographic Channel, and is most active in negotiating new major sporting rights contracts. A modest market take-up, initially of 100 to 200 subscribers per month has been projected, at a charge of \$25–35 monthly (Shoebridge 2010).

4.2 New offerings by individual new Service Providers (SPs) facilitated by NBN Co.

NBN offers the prospect of a possible single service provider in the form of a Sports Portal, an example chosen because of the remarkable popularity of broadcast sports in Australian households: of the current top rating 30 programs shown on Foxtel all are sport. It is possible that an Australian company could create a Sports Portal that would be a new kind of 'one shop stop' where consumers would have access to televised major sporting events, could access information about sporting competitions, get details about their team and players online, buy tickets to games online, bet online and post their own sports based user-generated content. In this case the Sports Portal would act as a single service provider and could have arrangements with a network provider and with NBN Co for interconnection to that network. The viability of such an initiative is in question and market predictions commonly suggest that new NBN market-based services will be dominated by ISPs, old and new. However new thinking about new business models points to the likely growing value of the monetisation of customer data.

4.3 Small operator live streaming businesses

There is a fledgling market for live streaming of 'minority' sports events — bowls, cycling, and water polo — that has grown throughout Australia during the past year and new companies are positioning themselves for greater opportunities that will come with NBN. Geoff Collinson, a manager of newcomer live streaming company RivusTv explains;

Take a sport like water polo. At a cost of \$5000 broadcasting an event is not possible. Under our model they (the organisation) pay a subscription fee of \$300 a month. Then they make their broadcast available on a pay-per-view basis, thus enabling the organisation to monetise the event. Same for basketball. For \$5 you can watch a National Basketball League game live over

the Internet through Rivus ... By integrating hardware, software, network and website solutions we take all of the technical hassles out of live video streaming ... Even the payment interface is embedded in our technology. A highlight is our unique pay-per-view capability — allowing our clients to make a direct profit from streaming their live and recorded content. (Kaplan 2010)

According to Collinson, Rivus Tv has now streamed more than 432,000 on-demand sporting items and received more than 30.2 million hits in the year preceding March 2010, with company revenues expected to exceed ‘several million dollars this year’(ibid).

Other entrepreneurs in this field have pointed out that the logistics of setting up web casts in sporting venues with only basic facilities can pose real problems for live streaming, but that there is a reasonable expectation of major improvements when NBN capability becomes widely available.

Comparable small-scale initiatives are likely to appear in fields other than sport, and the arts is potentially a NBN Co customer seeking such capacity.

4.4. Monetisation of user-generated content

The most significant developments within this category of services are likely to occur in relation to *You Tube*. Since the first upload of video on 23 April 2005, the website has attracted remarkable attention from ‘ordinary mortals’ uploading their own home-made videos and You Tube now boasts that 2 billion videos *a day* are accessed averaging 24 hours of video uploaded each minute, or the equivalent of 150,000 full length films per week (Chapman 2010).

You Tube now appears to be undergoing a metamorphosis in seeking to find a business model acceptable to its owner, Google. It has recently taken on new roles by streaming a trilogy of movies from Bollywood, and also by showing an U2 Los Angeles live concert to an estimated audience of 10 million. Its other new foray — into live sport — has resulted in 10 matches of IPL cricket being streamed from India attracting 11 million views and 7.2 million uploads. Shailesh Rao, Managing Director of Google India, explained ‘today we are not just interested in user-generated content video, but premium and professional content and also long form video, such as full TV shows’ (Lee 2010).

It is unlikely that Australia will see the emergence of its own distinctive home-based version of a *You Tube*, or a *Facebook*, or a *My Space*, associated with the roll-out of the national broadband network. Broadband suppliers do not appear to regard this phenomenon as a potentially increased revenue stream for them in future. There is, however, some expectation that both increased bandwidth capacity, together with a finer quality of resolution of the images, might marginally impact on broadband demand for open Internet video services in the future. Broadband suppliers usually choose to offer the unmanaged Internet services on their broadband networks, via an internal cross subsidy, to attract consumers to subscribe to their more lucrative range of managed services.

New broadband networks have the potential to change the dynamics of user generated content away from the extraordinarily popular open sourced ‘freebie’ site of You Tube — much to the chagrin of its adherents. The author of this paper can recall a visit to a children’s round robin soccer tournament in Stavanger, Norway, where many parents and others recorded videos of the matches that could then be later uploaded to Lyse, the local broadband company’s offering of four local children’s soccer channels for their subscribers to watch. Also the digital box that France’s company Free offers to its subscribers has a port in the back where a camera can be employed for a person to take film of local events, or anything else that they may fancy to film, and then send around the loop to other Free subscribers. Note that in this instance the loop is proprietary and not the equivalent of You Tube’s open Internet ‘unmanaged’ service.

4.5 New offerings from incumbents Telstra and Foxtel

The current position with the incumbent subscription television market is that Foxtel has market leadership with 1.6 million household subscriptions taking its service, and that after over a decade of struggling financially reasonable profits are now being returned. It does have a significant 'premium customer market' with just over 800,000 'Platinum subscribers' paying \$130 a month for almost all of the services available. This market take-up level has not gone unnoticed by prospective competitors. It is noteworthy that Telstra, a 50% owner of Foxtel (News Ltd and Publishing and Broadcasting Ltd each have 25% shareholding) is now offering some 'complementary' customer initiatives to its resident incumbent partner. But in what is understood to be tense corporate managerial dynamics between Telstra and Foxtel, in June 2010 Telstra launched its T-Box as a potential competitor to Foxtel's iQ2 digital box.

Telstra's T-Box is essentially designed as a high definition video recorder that enables viewers to watch streaming online channels, and its consumers can also hire movies and television shows. It is not an open market offering because consumers must also subscribe to either a high speed Big Pond Cable Elite, or Big Pond ADSL 2+. The T-Box enables viewers to record, pause and rewind free-to-air television, and to store about 100 hours of standard definition television. All data consumed is unmetered for these BigPond customers, with the single exception of viewing *You Tube* clips. Consumer responses at the time of writing have been generally unfavourable, with substantial criticism that units tend to 'freeze' or that the box has to be reset every few days due to loss of signal.

4.6 Global distribution initiative: Google IPTV

On 20 May 2010 Google announced plans to introduce Google TV on the Official Google blog:

What if we helped people experience the best of TV and the best of the web in one seamless experience? Imagine turning on the TV and getting all the channels and shows you normally watch *and* all of the websites you browse all day — including your favorite video, music and photo sites. We're excited to announce that we've done just that.

Not quite. The Google TV platform is likely to use either an updated Android based set top box that offers video-on-demand, support for special programs like *Twitter*, a browser, keyboard interface with remote control, or through new television sets manufactured by Sony or Logitech, reportedly due for release by the end of this year. Apparently consumers would also be able to use their iPhone or Android phone to operate Google TV. Developers, according to Google, should start optimising their web sites today for Google TV tomorrow.

Google has a long way to go with this venture but the advance publicity is hyper active. Jessica Guynn, writing in the *Los Angeles Times* in August 2010 described some enthusiastic responses from trial users:

Brittany Bohnet and fiancé Dave Morin used to plop in front of the television in their San Francisco living room with a smart phone in one hand and the remote control in the other, computers resting in their laps as they switched their attention from screen to screen. But with Google TV, the young couple can watch the latest episode of AMC's 'Mad Men', check updates from friends on Facebook and on Flickr showing off photos of Morin's marriage proposal — all on one screen.

According to Morin, (partner of Google employer Bohnet who is one of 400 Google staff trialling Google TV), 'People don't get what the possibilities are' (Guynn 2010).

Google faces monumental hurdles if this initiative is to succeed. Briefly, end-users will need to be persuaded of the value of developing new habits and to hook into either a new set-top box, or buy a new television set that runs on Google software. Also there is the thorny issue of finding incentives for the big American TV networks — ABC, CBS NBC, and also Fox — to co-operate with Google, and risk what they see as their 'signal control' without an as yet identified business model.

But it is *Google*. It is worth remembering that so much of the recent disruption, and the creation of new wealth in the communications industry in recent years, has come from the new non-establishment companies, such as eBay, Amazon, Netflix, but most of all from Google. Google TV has the potential to be one of the most disruptive innovations of all and is clearly pitched at the \$US 70 billion television advertising market as well as the \$70 monthly cable and television market in the USA — initially!

So how might these six new options above be seen in terms of Christensen's notions of disruption? The central NBN Co strategy is to provide an open platform that will encourage a raft of both existing and new service providers to enter into this new fibre based broadband era for Australia. This might mean that the Christensen's 'cheaper, low end products' will see an initial push for ISPs to enter with highly attractively priced services to capture first takers. Experience to date has seen one ISP entering the NBN Stage 1 pilot program, run by NBN Tasmania, offering an entry level plan priced at only \$29.95 monthly for 25 Mbps downstream speed, and a 15 Gigabyte data quota, but without long term contracts. This company has announced that these prices will be maintained until 30 June 2011 — when the official NBN Co wholesale pricing is expected to be available. This means that their new broadband offering costs consumers less than the present pricing of ADSL — vintage Christensen (Internode 2010).

And what of the prospect of entry by new individual service providers? Paul Brooks, of Communications Alliance, and a Lead Consultant to the NBN project, has predicted that between 50,000 and 100,000 new service providers might be spawned by the NBN initiative (ATUG 2010). Most of these potential newcomers will probably be undercapitalised providers who are likely to offer re-mix service offerings to niche markets, or versions of what Christensen saw as 'discontinuous service improvement'. Paul Brooks also predicted the likely necessity of the emergence of forms of aggregation if a plethora of small providers come into the broadband market place.

In the case of user generated content an intriguing possible trend could be what might be called inverted disruption. Some NBN service providers are likely to offer a digital box with a port in the back where a camera can be inserted for local film making, but where user generated content will only be distributed to the paying consumers of the particular provider's network. Hence instead of the posting home made videos on YouTube, openly accessible via the Internet, only viewers who subscribe to the proprietary network will have access. It is far too soon to predict how such inverted disruption of the now famous YouTube, that currently has over 100 million videos posted daily, might construct similar derivative business models themselves.

5. Conclusion

The National Broadband Network project has been subjected to intense scrutiny from multiple interests, vested and otherwise, throughout its short history. Frequent calls have been made for greater cost benefit analysis to be undertaken on the grounds that what is most needed is more 'data' to enable closer assessment of the possible benefits and pitfalls of such a major undertaking. Whilst it is difficult to oppose such studies in principle, their ultimate value may be limited given the extraordinary range of variables that could affect the rollout and take-up of high capacity broadband across such a large continent. And one of the most elusive of those variables is the extent that innovation, in its many manifestations, might succeed in the project. This encompasses how ideas related to broadband initiatives within the private, public, and community sectors could be nurtured; how successfully NBN Co's network architecture will be designed and implemented to enable the introduction of a wide diversity of applications and services that can run on high capacity broadband; and the extent to which consumer needs and corporate demand will buy into the project.

Early indications are that the project will facilitate the introduction of a new wave of what Christensen called disruptive technologies. This appears to be an essential ingredient to facilitate the growth of attractive new applications and services that could ultimately lead to a case for the

justification of such substantial investment. Associated with such micro disruption, the seeds of Schumpeter's notion of 'creative destruction'— in institutional contexts — may be already sewn. We could end up with a different version of more or less the status quo, but it appears that the incumbents will need a great deal of risk averse thinking to guarantee their place in a new order.

We may have forgotten one of the prime lessons from history of the long-term investment balance sheets of major communications platforms. Of all of the areas of R&D government investments in industry projects, the field of communications is undoubtedly a leader in terms of long term cost effectiveness and national strategic value. There were no 'cost benefit' analyses conducted prior to the beginning of the overland telegraph of the 1860s, or for the major public sector investment in the copper based national telephone networks in the 1940s to 1950s, or for communications satellites of the 1960s, or for the initial development by America's public sector in the early days of what became the Internet as we now know it. All of these platform initiatives were always on trial in their own way over their long histories but not in the narrow econometric sense that is demanded today. All of them created an expected array of outcomes of so many varied forms on innovation. Can we expect the unexpected again?

What may be most on trial now for NBN may be the capacity and desire for Australians to take risks and back innovation in principle — however it may turn out. Only time will tell whether these were risks not worth taking.

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