

A network diagram consisting of numerous white squares of varying sizes connected by thin white lines, set against a solid blue background. The lines radiate from several points, creating a complex web of connections.

A Snapshot of

Australia's Digital Future to 2050

IBISWorld

WHERE KNOWLEDGE IS POWER

Preface

Phil Ruthven

Founder and Chairman
IBISWorld

Broadband is now one of the core economic indicators across the world, and is considered a human right by the United Nations. Superfast broadband of the order of 100+ megabits per second (Mbps) and into the gigaspeed bracket is de rigueur for any nation purporting to be a developed and advancing economy. High-speed broadband has pervasive usefulness that extends across businesses, governments, households and individuals.

Compared with other leading countries, Australia's roll-out of this new-age utility has been slower. But now, superfast broadband is on its way to most Australian citizens and businesses.

We have begun to enter the second stage of the Infotronics Age, which began with the rapid growth of new service industries and the Information and Communications Technology (ICT) Revolution in the mid-1960s. This second stage could be termed a hyper digital era, such is the combined power of ICT enhanced with ubiquitous high-speed broadband plus analytics, learning systems, cognitive computing and more.

Whatever we choose to call this new addition to our arsenal of utilities, it will affect the way society functions, communicates, works, shops and recreates. It will particularly affect businesses, some of which will not survive unless they embrace and harness the era's technological potential. Access to information using high-speed broadband will create a more open dialogue between government and the community, with governments putting more information online and using social media tools to better engage.

Three-quarters of the nation's businesses believe a national broadband infrastructure will increase their ability to engage in the digital economy, according to a recent Nielsen report. For all that, businesses are reportedly struggling to integrate ICT into an overall strategic vision. This second decade of the 21st century needs to be one where Australian businesses and government catch up to today's increasingly borderless and competitive world.



About the Author

Phil Ruthven is the Founder and Chairman of IBISWorld, an international corporation providing online business information, forecasting and strategic services. He is a board member of the Melbourne Institute, a recent past director of Open Family Australia (a charitable foundation aiding street children), a recent Director of CEDA and an Honorary Adjunct Professor at the University of Technology, Sydney. Phil continues to be one of Australia's most frequent and prolific commentators in demand by the media, and is widely considered the nation's most respected strategist and futurist on business, social and economic matters.

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Key Definitions

The New Age

The new age in this report refers to the period 1965 to the late 2040s, often called the Post-Industrial Age. More recently, this age has been variously referred to as the Information Age; the Digital Age; or the Infotronics Age (as IBISWorld has termed it for more than 30 years, in deference to the beneficial role of information and electronics across the economy, industries and society).

A distinguishing feature of the new age is that service industries have come to dominate the economy (> 70% in 2012 versus <50% in 1965), unlike all previous ages of progress in which goods industries dominated.

The timeline for the ages of progress in Australia are as follows:

Hunting and Trapping Age	Up to 1820
Agrarian Age	1821 – 1864
Industrial Age	1865 – 1964 Stages 1 and 2
Infotronics Age	1965 – 2040s Stages 1 and 2

Utilities through the Ages

There have been enabling utilities (pervasive new systems and technologies for industries and households) in each new age, as follows:

Hunting Age	No pervasive utility (even the wheel was not a pervasive utility)
Agrarian Age	Transport (including the wheel and carts, roads and water transport)
Industrial Age	Mechanical power (water wheel and steam engines) in Stage 1 Electrical power (electricity and telephony) in Stage 2
Infotronics Age	ICT (information communications technology) in Stage 1, to 2006 ICT enhanced with ubiquitous high-speed broadband plus analytics, learning systems, cognitive computing in Stage 2, to the late 2040s

The new utility

In this report, the new utility refers to the utility enabling the second half of the Infotronics Age from 2007 to the late 2040s: ICT enhanced with ubiquitous high-speed broadband, plus analytics, learning systems, cognitive computing and more.

Progress is being driven by the convergence of cloud computing, analytics, learning systems and ubiquitous high-speed broadband in fixed, mobile and wireless form. These technologies will lead us to a point where a large percentage of Australia's products and services – and work itself – will be strictly digital. This new utility will be as revolutionary in its impact as its predecessors including transport in its many forms; electricity, telephony; water, gas and sewerage.

Broadband Speeds

In this report, we have adopted nomenclature on broadband speeds as follows:

Broadband	2-25 Mbps
Fast broadband	26-100 Mbps
Superfast broadband	100+ Mbps
Giga-speed broadband	1000+ Mbps (1+ Gbps)
High-speed broadband	Term to capture all above broadband speeds



Andrew Stevens
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Foreword

The unprecedented natural resources boom, together with a low public debt level and prudent banking sector, has buffered Australia's economy from challenging global macro-economic conditions. Consequently, it is easy to overlook the need to address the nation's sustained productivity decline and the importance of securing longer-term prosperity.

IBM believes part of the solution will come from how business and government leverage our increasingly connected and networked world. Commissioned by IBM, *A Snapshot of Australia's Digital Future to 2050*, looks ahead of existing research to examine how Australia can harness ICT enhanced with ubiquitous high-speed broadband to create a sustainable economy.

In doing so it asks: how will the dawn of this digital future further affect our lives, our cities and the way we interact? Which industries will disappear? Which will prosper? And what new industries will emerge?

The report reveals that ICT as we know it, enhanced with ubiquitous high-speed broadband will become Australia's new utility and the most important utility of this century – one as historic as its predecessors.

Australia's digital future will transform some industries, including knowledge industries, health and educational services, which will be underpinned by digitised products and services. From an economic viewpoint, by 2050, this new utility will generate around \$1 trillion in revenue – almost eight times higher than the \$131 billion it generates today. That accelerated leap in projected revenue is just one of the indicators of the criticality of this new utility – not just for revenue, but for the underlying improvements in economic development and quality of life it will bring for Australia.

To make this digital future a reality, businesses and government must decide how best to leverage our increasingly ubiquitous digital infrastructure, and how to help Australia shift from a natural resources-dependent economy to a more diverse 'developed resources'-oriented economy.

I commend Phil Ruthven and IBISWorld on producing *A Snapshot of Australia's Digital Future to 2050* – the first report in the world to rate a nation's industry classes against the impact of the new utility. Given the importance of technology in reversing Australia's productivity decline, opening up new markets, and generating new employment opportunities, this type of discussion is essential. I hope it spurs Australian industries into planning for and investing in a digitally-connected economy and society.

Executive Summary

The ubiquitous adoption of high-speed broadband services, in concert with technology, will enable powerful innovations across different sectors of the economy: from business to business, business to the home, and machine to machine. In turn, these applications will help address social and economic challenges of the future.

For every ten percentage point increase in broadband penetration, GDP increases by 1% and doubling an economy's broadband speed increases GDP by 0.3%².

Significant work has already been done to measure the economic potential of high-speed broadband and digital technology. The Australian Government's extensive research has found that high-speed broadband will have countless benefits to everything including small and rural businesses, disabled citizens, Indigenous communities and industrial productivity. The Government's National Digital Economy Strategy¹ is structured based on these findings, which include:

- Between \$2 billion and \$4 billion in benefits per year from wide-scale implementation of telehealth systems;
- Up to \$1.9 billion in savings (and almost 320,000 tonnes less of carbon emissions) if current teleworking goals are met;
- Up to \$2.4 billion in savings for households if internet access increases by 10%.

Already in 2012, ICT enhanced by emerging high-speed broadband and online information is expected to deliver revenue of \$131 billion in Australia. Based on this report by 2050, this new utility will generate around \$1 trillion in revenue. Reports indicate that, for every ten percentage point increase in broadband penetration, GDP increases by 1%; doubling an economy's broadband speed increases GDP by 0.3%². Today, even with our present 'pony express' form of broadband, the value of the internet to the Australian economy rivals iron-ore exports.

However, this report, *A Snapshot of Australia's Digital Future to 2050*, looks ahead of existing research to the likely shape of Australia's digital future by 2050. It is the first report in the world to rate a nation's entire list of industry classes against the impact of ICT enhanced by ubiquitous high-speed broadband (see Chapter 4 in the complete report for more details of this rating system and the methodology used). In doing so, it covers an ambitious breadth and scope of territory, examining: the macro-environment for Australia; the impact of high-speed broadband in the Infotronics Age; the impact of the digital future on industries; Australia's society of the future (including cities and work); and recommendations on how we can capitalise on our digital future.

The report predicts that, in a future enabled by further investment in superfast broadband we can expect substantial changes to our economy and society. In the community, we will have fewer commuters, smart homes and cost-effective health care. In the economy, 10% of Australia's 509 industries (accounting for 23% of the nation's revenue) will not function without this new utility; a further 17% of industries (also 23% of the nation's revenue) will use it to drive step-changes in their business; and 70% of the industries (accounting for 54% of revenue) will benefit from generalised productivity gains.

The Macro-Environment for Australia

ICT enhanced with the inclusions of ubiquitous high-speed broadband, analytics, learning systems and cognitive computing is predicted to evolve from a 'value add' to becoming Australia's new utility, after: transport in the Agrarian Age; mechanical power in the first half of the Industrial Age and electricity and telephony in the second half of the Industrial Age

The report also finds that Australia's resource focus will shift from natural resources to developed resources (educated labour force, internet, communications, infrastructure, services and utilities), which account for more than 78% of annual wealth in Australia, and four-fifths of our workforce.

From a macro-productivity perspective, Australia will see a return to its long-term average productivity growth of 1.7% by 2020, compared with the current 0.6% over the past five years. This increase in growth is substantially due to the new utility.

Future Trends

All surfaces could become potential interface points with computers, devices and networked technology.

The report suggests that by 2020 we will see a massive increase in data usage. Australian consumers will need a monthly data allowance of almost 200GB by 2020 and potentially five terabytes (TB) by 2030.

In terms of devices, the report anticipates that superfast broadband and technology will enable an increase in haptic devices that have the capacity to simulate the sense of touch, based on a virtual 3-D environment.

In addition to these findings, the report looks further ahead to the direction that technology and related applications may take. Some key predictions are:

- **All surfaces could become potential interface points with computers, devices and networked technology.** This is already evident through the invention of electronic contact lenses³ and the development of devices that allow users to issue computer commands using their own skin as a touchpad⁴. Other developments include epidermal electronic systems (EESs), which are microfilmic layers of electronics that can adhere to the human skin like stick-on tattoos and have already been successfully used to monitor human vital signs. EES technology could soon allow wearers to interface with sensors and devices via proximity or touch⁵.
- **The development of direct neural control over devices and ICT systems.** Brain-machine interfaces (BMIs) have allowed animals to control robotic devices using their brain alone. The same technology is now being tested in disabled patients but could extend its applications to broader human augmentation⁶.

Industry Impact

Australia's digital future will transform a raft of industries. Industries across 13 divisions (of the nation's 19) within Australia are predicted to be transformed, or to significantly benefit from, the new utility⁷. The total revenue for 2012 of these opportune industries is \$1.25 trillion or 31% of the nation's total revenue of \$4 trillion.

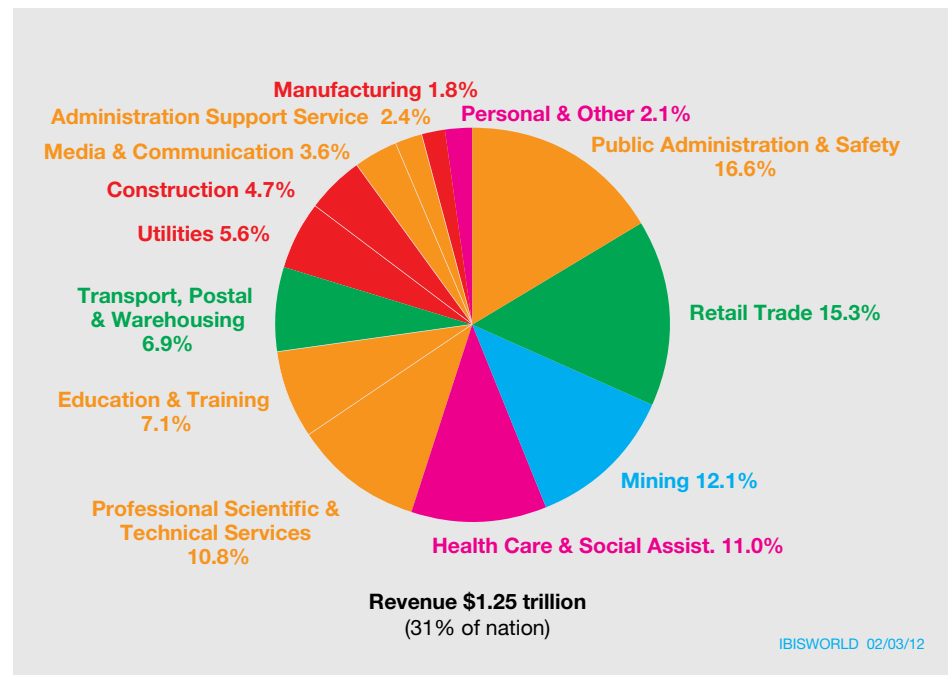
For a detailed breakdown of these industries by revenue, see **Table 4.20** on page 77 of the full report.

Fig 1.1
Opportune Industries
Weighted revenue of
prospective industries,
% of total 2012

Graph depicts
transformational
and significant rated
industries.

Some revenues have
been discounted from
tabulated results:
1) *significant* is
weighted at two-thirds
revenue; and 2) Public
Administration and
Safety is weighted
at half due to double
counting of revenue
(transfer payments)
and social welfare.

The proportions do
not purport to be
convertible directly to
ICT spending in the
same proportions.



Methodology

The following assessment of the prospects for the 509 classes of industry in the Australian economy over the next 40-50 years, is the work of an Industry Impact Panel comprising: the author, Phil Ruthven; Dr Kate Cornick and Brad Gathercole, IBES; Larry Quick, Resilient Futures; Dr Elaine Miles and Ian McGowan, IBISWorld. The Industry Impact Panel set out to determine which of the 509 classes of industry would, as a consequence of the new utility: likely demise; gain a generalised advantage; experience a significant impact or have a transformational impact.

Findings

Seven out of the 19 industry divisions that house the 509 industry classes will benefit most from as summarised in **Table 1.1**.

Table 1.1
Key divisions to benefit
from the new utility
and the impact

Key beneficiaries from the new utility by % of opportune industry revenue

(based on 31% of the nation's \$4 trillion total revenue in F2012)

1 Public Administration and Safety

Superfast broadband, analytics and advanced software programs will give us smarter, fast-response emergency services, which will use predictive analytics to forecast and mitigate the impact of natural disasters, among many other innovations.

2 Retail Trade

Retail will continue its online revolution, with eBay, Amazon and other diverse product group providers redefining the traditional concept of high street and shopping centre retailing.

3 Mining

Smart sensors and machine-to-machine communications will reap productivity benefits for mining by taking out labour costs and increasing efficiency. Superfast broadband will play a very important function in logistics, virtual operations (including robotics), ore grade use optimisation and exploration analyses. This will become much more important as mineral prices pause and fall after the current cycle peaks in the 2020s, if not earlier.

4 Health Care and Social Assistance

Poised to become Australia's biggest industry division and employer well before 2050, this division must harness all the power of analytics and the speed and connectivity of superfast broadband to prevent what will otherwise be a massive cost burden by the late 21st century. In this division, superfast broadband will be vital in driving healthcare costs down by faster diagnostics, preventive health systems, partial self-diagnostic services and more efficient systems and operations in hospitals.

5 Professional, Scientific and Technical Services

This industry division will grow on the back of more business service function outsourcing, the rise of online information, a massive increase in creative and enabling software, the growth of ICT in the form of cloud computing and many other activities.

6 Education and Training

Education must embrace the new paradigms powered by superfast broadband, and new delivery systems (including virtual delivery), if Australia is to become smarter in an increasingly borderless and competitive world. This is particularly important for higher education, which is facing growing competition from the increasingly information-oriented emerging large economies in the Asia-Pacific.

7 Transport, Postal and Warehousing

Along with water, energy and gas, Transport, Postal and Warehousing will reap major productivity benefits from the use of smart sensors and machine-to-machine communications that enable automated or more efficient operations.

Likely demise

The predicted 15 industry classes (out of 509) outlined in **Table 1.2** risk demise, unless they reinvent themselves; for some, successful reinvention appears unlikely within the required timespan. This group represents less than 1% of the current revenue generated by industries. High-speed broadband spells the decline of traditional retailing in the decades ahead. Much of wholesale trade may eventually be cut out of the equation, as the new utility enable producers to target end-consumers without the need for middlemen. Other casualties may include: newspaper, magazine, book and directory publishing – substituted by their online versions; radio, free-to-air TV and cable TV broadcasting – absorbed into internet distribution; and video rental.

Table 1.2
15 Industries
Predicted to Demise
Revenue Guidelines
\$billion, 2012 (E)

T	Transformational
S	Significant
G	Generalised
D	Likely Demise

Industry	\$billion	T	S	G	D
Reproduction of Recorded Media	0.2				
Book and Magazine Wholesaling	1.5				
Entertainment Media Retailing	1.1				
Newspaper Publishing	4.9				
Magazine and Other Periodical Publishing	1.3				
Software Publishing (Disc)	0.9				
Motion Picture Exhibition	1.9				
Radio Broadcasting	1.4				
Book Publishing					
Directory and Mailing List Publishing	2.7				
Other Publishing (except Software, Music and Internet)					
Free-to-Air Television Broadcasting	4.3				
Cable and Other Subscription Broadcasting					
Video and Other Electronic Media Rental and Hiring	1.0				
Photographic Film Processing	0.5				
Total	21.7				

Australian Business and Society of the Future

Possibly one in four people in the workforce working at least partially from home if not full-time by the middle of this century.

Enterprise and workplace of the future

Medium-sized enterprises, or companies with revenue of \$1 million-\$100 million, will continue to experience the fastest levels of growth due to: the trend to outsourcing by households and businesses, creating new entrepreneurial opportunities; the lower need or demand for capital (being service industries that are the fastest growing); and more flexible lenders.

Teleworking will continue as a key trend, with possibly one in four people in the workforce working at least partially from home if not full-time by the middle of this century. If so, we would have five million working from home at least part of the time – taking millions of commuters off the roads.

As the new utility helps overcome the tyranny of distance, it will reinvigorate regional centres and some rural communities, with teleworking enabling some jobs centred in capital cities to be relocated to the bush. Skilled workers will be able to live anywhere if they so choose, and businesses will be able to source skilled employees across international boundaries.

Australian households and cities of the future

It is likely that communications, including telepresence, will become the 'surrogate transport' by 2050. Australian households could be allocating up to 40% of mobility spending on telecommunications, double that of 2010. This will be partly driven by the use of superfast broadband and technology services to work from home more frequently than we do now.

Household outsourcing will continue as household expenditure is shifting to outsourced chores and activities, which now exceed all retail spending (except motor vehicles, et al). In the future, the new utility will support, if not underpin, many new outsourced services for individuals and households.

Our cities will become smarter, with fully digital infrastructures, enabling us to improve lifestyle and economic success. The focus will be on improving old infrastructure, applying new business models to fund these investments, and enhancing public safety and emergency communications.

Capitalising on Our Digital Future

The future society is not a singular entity, but a collective of numerous networked communities and individuals.

Australia has already entered a new era over the past five years: the second half of the already-exciting Infotronics Age. It could well prove to be a new golden age for the nation of the sort it has experienced just three times in its two-and-a-quarter centuries of progress, where full employment and a fast rising standard of living were de rigueur.

The transition into the world envisioned by this report will be marked by changes ranging from the subtle to the forcefully disruptive. The boundaries will continue to blur between work and leisure, public and private, technological and human. Businesses will incorporate community and customer collaboration into their very essence, providing immersive cross-channel engagement with their stakeholders based around access to comprehensive real-time data. Social media and networking technologies grow in parallel with an increasingly autonomous and individually-empowered workforce, resulting in more horizontal business hierarchies.

Future shapers of change – organisations

- Deliver business model innovation
- Drive customer and community collaboration
- Integrate cross-channel
- Obtain insights from analytics
- Optimise the digitally-enabled supply chain

The changes wrought on business have greater implications for individuals and their citizenry in future society. Education makes a transition from a mass medium to a pluralism of bespoke yet global offerings, developing new skills and communities around the learning process. The horizontal business exists as part of a horizontal society in which work focuses on objectives rather than spending a specific amount of time in a specific place. As mobility of work and lifestyle increases, the very notion of citizenry evolves to span multiple virtual and physical communities and an even greater variety of cultural practices and norms. The future society is not a singular entity, but a collective of numerous networked communities and individuals.

Future shapers of change – citizens

- Nature of work is changing
- New tribalism
- Longer and healthier lives
- New internationalism

We need to embrace the fast-changing economy and society that this report predicts in this new century and capitalise on the digital future that is underpinning so many of these changes.

End Notes

- 1 http://www.nbn.gov.au/files/2011/05/National_Digital_Economy_Strategy.pdf
- 2 http://www.ericsson.com/networkedsociety/media/hosting/Need_for_speed.pdf
- 3 'Augmented Reality in a Contact Lens: A new generation of contact lenses built with very small circuits and LEDs promises bionic eyesight', by Babak A. Parviz. IEEE Spectrum, September 2009; See also 'Self-assembled single-crystal silicon circuits on plastic' by Sean A. Stauth and Babak A. Parviz, Proceedings of the National Academy of Sciences of the United States of America, 2006.
- 4 Kei Nakatsuma *et al*, The University of Tokyo Department of Information Physics and Computing, Innovation News Daily, August 10, 2011.
- 5 'Epidermal Electronics', Dae-Hyeong Kim *et al*, Science, 12 August 2011.
- 6 'How to Control a Prosthesis With Your Mind', by Jose M. Carmena, IEEE Spectrum, March 2012.
- 7 **A transformational benefit rating** – given in cases where the new utility would virtually underpin the industry in terms of product, features and delivery, or indeed enable the industry to exist at all.
A significant benefit rating – inferred such possibilities as product embellishment, potential productivity gain or other advantage that could be reflected in faster growth, lower costs and/or higher profitability.

Glossary

e-Health Combined use of information technology and electronic communication in the health sector, giving healthcare teams and patients access to their medical records when they need them

(E) estimate

(F) forecast

GDP Gross domestic product

haptic devices Capability to simulate the sense of touch, based on a virtual 3D environment

HFC Hybrid fibre coaxial cable

ICT Information and Communications Technology

IP Intellectual property

Mbps Megabit per second

megalopolises A very large city, or region made up of large cities

new utility - ICT enhanced with ubiquitous high-speed broadband, plus analytics, learning systems, cognitive computing and more

OECD Organisation for Economic Co-operation and Development

SOL Standard of living

SMEs Small and medium enterprises/businesses

TB Terabytes

telework A flexible work arrangement where the daily commute to a central place of work is replaced by telecommunication links, and most work from home

