

# ○ NATIONAL INFORMATION INFRASTRUCTURE UBIQUITY

## ENABLING EVOLUTION

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Today's broadband and Internet frameworks enable a wide variety of applications and services; from gaming to banking, distance education to online media, dating services to health monitoring – and the rate of new applications continues to grow in function and volume. Of particular interest here is this rate of service and application creation and how such growth can be facilitated within the Australian environment – for the benefit of all Australians, as both consumers and producers of these applications.

## APPLICATIONS & SERVICES

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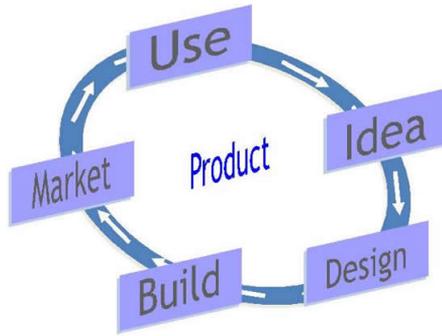
Before considering any Australian nuance however, let us first explore the nature of this rapid growth in application and services and the circumstances that have fostered such growth.

## NEW APPLICATIONS & NEW SERVICES...

The classic product development lifecycle (Figure 1) takes an idea and converts it into a product, deploys it, encourages use and typically utilizes user feedback as part of the next product development cycle. This simplistic process is followed for almost all products and yet the rate at which new products are becoming available within the consumer appliance and Internet domain is exceeding all previous benchmarks. Is there, therefore, a set of circumstances and/or enablers that are facilitating such a rapid growth? And if so, what do these 'enablers' actually provide?

If we consider the last 30 years, Moore's Law has prevailed; and yet the rate at which new end-user devices, applications and services are becoming available has only really accelerated within the last 10 to 15 years. Could we not then speculate that Moore's Law is not the only factor contributing to this unprecedented growth? Is there another circumstance that has come into play? A circumstance – or, in this case, an enabler – that is the Internet! Is the ubiquity of the Internet, combined with the never before available capability of widespread collaboration yielded by the Internet, the true source of growth?

Perhaps there is a historical perspective that can help us understand.



**Figure 1** Product development lifecycle

## UBIQUITOUS INFRASTRUCTURE – ITS IMPACTS

### CARS, TRUCKS, BUSES & THE HORSELESS CARRIAGE

In the early 1900s the horse and cart was under attack from the first automobiles – but it wasn't all going the automobile's way! Road surfacing was a significant factor in the overall performance particularly as the automobiles improved and outgrew the performance of the road itself. The shift from compressed dirt and gravel roads to a greatly improved concrete and bitumen surface began.

It was the business model that consumers saw, that is of most interest to us here. It was initially very simple, really one-dimensional and comprised the notion that the automobile was faster when used on the new roads; making the business case for it merely as 'a faster horse'. Or perhaps more accurately, a faster horse and cart because it was the automobile's ability to more efficiently, reliably and comfortably carry several people that was the original attraction. Gradually the basic range of passenger vehicles was expanded to fill more specific needs and specific business models began to emerge. Various goods began to be transported using larger vehicles tailored to suit this application. Special purpose vehicles to support government-funded services such as fire trucks and ambulances were introduced to support yet more specific business models.

All the while, the national coverage of bitumen roads was expanding. Eventually, all new houses and businesses were built with high quality road access as a given and existing property access was upgraded to finally deliver infrastructure ubiquity. As this road coverage expanded, so did the range of business models. As automobiles – both passenger and goods transport - improved, along with the national highways, it became more economically feasible to create new towns further away from the major population centres, both in terms of easier access for people, but perhaps more importantly, in terms of the delivery of goods such as primary produce and mining products etc. The ongoing expansion of the number of successful business models continues to expand even today.

In the later part of the last century, most major cities across the world have found themselves in the grip of major traffic congestion during the morning and evening peak traffic load times. Roads simply overflow with traffic moving people and goods in high volumes. To alleviate this congestion, most large cities have deployed sophisticated traffic control systems that centrally monitor and manage congestion in real time in the central business districts. This permits a more

sophisticated traffic control mechanism to be used; and road users are generally completely unaware that without this operating, their peak hour journeys would be much slower. Indeed, this traffic control system has enabled even more new business models and can be compared to 'Quality of Service' in the telecommunications industry.

Consider the special purpose high-speed ambulance service designed specifically to urgently transport organs from donor to recipient for organ transplant surgery. This kind of surgery has only been possible for the last couple of decades, and aside from all the medical advances underpinning this capability, the traffic control systems and the quality of the roads and ambulances are important enablers. Yet another specific business model created from a combination of traffic management on the roads, special ambulance 'devices' and medical expertise.

Today, as our on-line shopping behaviours develop, the need for highly competitive and efficient goods transport and delivery to your home is creating another wave of roads-based business models. We would argue that as the information-based economy continues to mature, there will be a significant shift in business models leveraging the national roads infrastructure. Some older business models may well disappear, while new ones replace them; and the net effect will be the continuing, indeed relentless, evolution of roads-based business models that share a basic and common theme. Ubiquitous road infrastructure, special purpose vehicles and applications that consumers value which ultimately offer consumers a value proposition that succeeds in a competitive market.

Over the last century, all vehicles have relentlessly become more complex. The horseless carriage has today become an extremely wide range of special purpose vehicles ranging from the humble bicycle through to an exotic sports car, goods transporter, trench digger or people mover, ambulance or fire truck. And in all these cases, the vehicle is highly complex with typically about one hundred microcomputers hiding much of this complexity from the driver and the occupants. The typical vehicle today does many complex tasks for us and we simply are unaware of the underlying action. For example a computer is used to control the engine speed, fuel and air mixture and ignition timing during the warming up phase of a journey to ensure the vehicle runs smoothly to improve the efficiency and ride comfort. This trend is continuing to add more complexity within the operation of the vehicle while presenting the driver with simple choices and options. Cars that can parallel park themselves are already available and this feature will be commonplace within a decade.

## **THE EMERGENCE OF UBIQUITOUS BROADBAND**

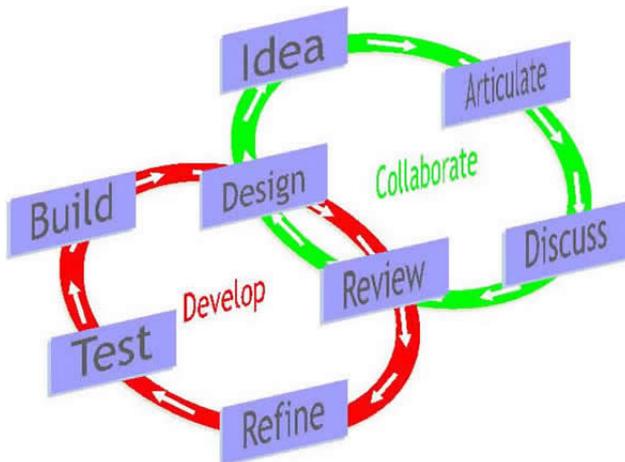
Today the word 'broadband' is synonymous with 'Internet'. All that broadband currently offers is access to the Internet with higher bandwidth than previously possible. It also provides us with an 'always-on' Internet connection. The description of a dirt road and a single horse and cart style of transport is analogous to this form of Internet access. Even with such limited scope, the Internet has, however, provided a launch pad for new applications and, even more importantly, enabled a collaborative framework for the dissemination and review of ideas, designs, concepts and applications. Never before were mechanisms available to communities of interest to discuss ideas, brainstorm technologies and propose services – independent of their geographical location. Such mechanisms meant that the 'backyard' inventor now had access to a review panel of experts and a support base from all over the globe.



**Figure 2** Collaborative framework for the dissemination and review

Furthermore, the ubiquity of the Internet gave all inventors everywhere a common platform on which to develop their applications. Gone was the 'closed' shop that was the legacy telecommunications frameworks and specialised application frameworks. Now, anyone could not only develop an application, but a support framework was in place to have their ideas and designs reviewed – collaborative development on a standardised platform became a powerful process for new applications.

Similarly, testing of applications, feedback of functionality, interfaces and behaviours was also a by-product of the Internet – to the extent that collaborative developments became possible. Gone was the need for an individual to implement the whole 'solution' due to lack of localised resources – instead, libraries of functionality could be incorporated from disparate sources or development groups established to assist in development. Such 'groups' could be voluntary or commercial in nature.



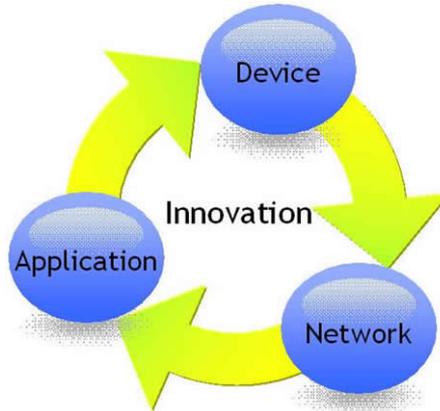
**Figure 3** Collaborative development using the Internet

In essence, the design and development models available to everyone were augmented by the Internet.

# TECHNOLOGY EVOLUTION – ADDING FUEL TO THE APPLICATION EXPLOSION

## SIMPLY POWERFUL

Just as the compelling combination of vehicle, ubiquitous road infrastructure and application gives rise to a wide range of business models so does the combination of device, ubiquitous broadband networks and applications in today’s information age.



**Figure 4** Devices, broadband networks and applications in combination foster innovation

Computing processor power is continuing to grow. In fact since the first microprocessors (Intel’s 4004) were introduced into the market in 1971 there has been a constant growth in processing power. Moore’s Law emerged to illustrate this trend –it says that processing power doubles about every 18 months. There are several other elements that play an important part in the cost and performance of devices including the amount of memory, the quality of the screen, overall power consumption and the all-important battery performance. Each of these technology areas is developing in a similarly predictable way. For example, memory costs are falling and memory capacity is growing. This combination results in a staggering overall reduction in price per byte of memory. For example, by 2020 we foresee memory costing only about 0.1 cents per gigabyte. This translates into the ability to store even a high definition movie for only a few cents!

Very high quality screens suitable for both portable and fixed devices are improving continuously on several fronts. Resolution, brightness, power consumption, colour quality, speed, as well as physical characteristics such as weight and thickness all play a role in the constant improvement in the overall quality and utility of devices. The next two generations of super high definition and ultra high definition screen technology are already defined and in use within specialist medical equipment and will break into the consumer market over the next few years.

And the rate of improvement is increasing – through re-use of the very technology that is being enhanced, more advanced variants are created. Powerful frameworks are used to create an even more powerful framework; powerful computers design, model and fabricate the next generation components; advanced software development frameworks assist in the development of the next iteration of software development tools – the cycles repeat.

So, when innovators put all these elements together we see an extraordinary array of devices in the market place that continue to surprise and entertain us. We need look no further than the iPod and iPhone from Apple to see devices that have revolutionised their market sectors. The iPod created a completely new market for MP3 players and introduced an entirely new interface approach and application for managing music – iTunes. The iPhone invaded the mobile phone market and drastically changed it into an applications market through the introduction of the iStore. The short-term result: more than ten times more data traffic per device compared with other advanced, data-enabled mobile phones.

### POWERFULLY SIMPLE

The devices story is far more widespread than just the impact Apple has had on their specific target markets. Weather devices are stand-alone, connecting to a simple web site or connected to the cloud computing world. They perform one extremely important function, which is getting much more important to the end users – that of hiding complexity from the users. We have been living for several decades now in a world where the hapless user has been confronted by an ever-increasing complicated set of interfaces, applications and functions.

The most basic of mobile phones today have evolved into a Swiss-army-knife-like affair that can very easily confuse the users. Moreover the vast majority of phone functions remain dormant or under-utilised within the device and network, because the users simply do not have the patience to work out how to use them – and perhaps more importantly they do not see the value of these functions anyway. This ever-increasing complexity is going to change. The end of this phase of device evolution is now in sight and a better future is beginning to emerge. A challenge remains however. End users are now conditioned to this complexity challenge and it will need to be overcome if future devices are to succeed in the market.

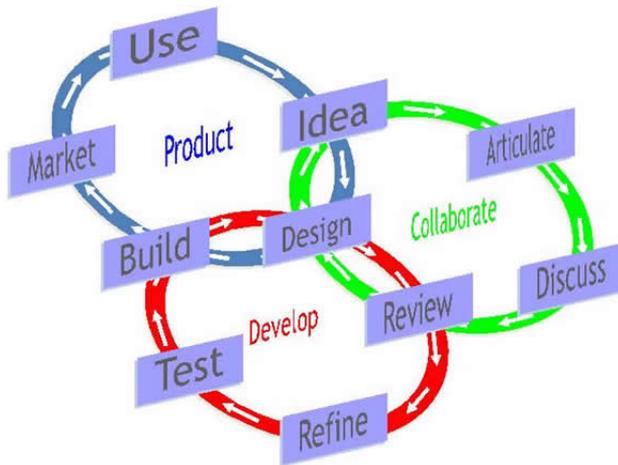


Figure 5 A new business model

That future is one where devices provide us with a very complex capability, presented in a highly simplified and intuitive manner. One might wonder what all the processing power and memory in future mobile handsets will be used for and this provides most of the answer. As

devices get more powerful, this power will be used to hide complexity and present the user with only the things that they need to make decisions about the outcomes for which they are looking. For example, digital cameras will take a picture with a simple click of a button – yes this is obvious and commonplace already – however this is already hiding a great deal of processing complexity from the photographer. In the near future the camera will automatically send that photo to a secure storage place and catalogue it in a way that you find intuitive and easy to find at a later date. The camera will have a mobile phone in it for this purpose, but the user will not perceive the act of making a call to send the photo; it will simply be a part of the photo-taking button click. And you will probably not pay for the network call but rather for the photo backup and filing service.

Amazon's book reader Kindle device today is a great example of this business model, available now. The Kindle device is an electronic book. It is also a 3G mobile phone but the user is unaware of this fact. The user simply buys a book and Amazon takes care of the phone call billing with the service provider. The start of a new business model that will continue to evolve into Magazine and Newspaper distribution as the Kindle evolves to re-writable electronic paper.

## **UBIQUITY & POWER: PARTNERS IN EVOLUTION**

### **THE STAGE IS SET, ALMOST...**

The technology is evolving, the infrastructure is in place, the people are communicating – both their desires and their ideas – the stage is set! Or is it? The ubiquity of the Internet has enabled the rapid increase in the rate of new services applications and has allowed us to communicate our ideas and wants in ways we'd never thought possible and on a scale never before seen. But just as technology is evolving in an ever increasing pace, so too are the demands on the enabling communications frameworks that is 'The Internet'.

Today, we see the burgeoning industries and services that are taking shape: eHealth & Telemedicine, eLearning & Distance Education, Immersive Collaboration & Distributed Offices, Gaming & Immersive Media, with countless others that haven't been defined yet – industries, applications and services that are just waiting for the right set of circumstances to emerge.

Those circumstances will be driven, just as they have been for the last few decades, by the emerging capabilities of the Internet, networking more generally and the underlying broadband access networks. New products will be enhanced through collaboration, new ideas fostered through communities of interest and new developments augmented by a peer group that transcends national boundaries.

The 'ubiquity' of tomorrow's Internet, however, is being challenged – and Australia's ability to participate in the evolution that will come, both as a supplier and consumer of new applications and services, is in question. As successive iterations of new applications and services demand ever increasing throughput and quality from the 'ubiquitous' Internet, those that cannot support such requirements will struggle to engage.

### **NATIONAL BROADBAND NETWORK (NBN) – SETTING THE STAGE, FOR AUSTRALIA**

The NBN is about a ubiquitous information infrastructure. It's about empowering Australians to contribute on a level playing field and allow them to access and utilise applications and services

from all over the world. Most importantly, the NBN is about removing the digital divide and ensuring equality so that all Australians can benefit from a rapidly evolving technology landscape.

For End Users living in an NBN world, their access to, and use of, technology will be simpler – yet richer in function and capability thanks to new more powerful devices that effectively hide the complexity. We’ll be able to compete in a global economy, whilst enhancing our local community – location & distance will continue to decrease as a discriminating factor in their lives.

Leveraging this national infrastructure to help solve many of our rural and remote challenges presents a wide range of opportunities. Through the innovative use of devices, networks and applications, these solutions will significantly improve the delivery of many services into rural communities across a range of industry sectors as diverse as health and education to agriculture and mining. If the Australian ingenuity successfully delivers these benefits then the NBN will truly enable economic growth across the board and create significant export rewards as well.

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