SMART INTERNET TECHNOLOGY CRC

SMART INTERNET 2010

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Acknowledgment

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Smart Internet 2010

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i. Preface

The origins of this Smart Internet Technology CRC project reside within a CRC management discussion in 2003 that involved researchers and sponsors about the need to construct a credible and imaginative research report about Internet futures. The group recalled the fine work conducted by the National Telecommunications Planning Unit in the early 1970s about "planning new services for markets that do not exist, complex technologies that are rapidly changing and a socio-economic environment which widely agreed is becoming unstable and turbulent." After two and a half years of thorough investigation the NTP's seminal report *Telecom 2000* was delivered in December 1975.

A quarter of a century later the original Project Director of *Telecom 2000*, Tony Newstead, in hindsight reviewed their remarkably astute findings. Newstead added: "the main benefits of such wide ranging studies flow not so much from forecasts made as from insights gained along the way." Though there are some important differences between the methodology and approach of this project, **Smart Internet 2010,** and its forerunner, *Telecom 2000*, their overall objectives are comparable.

ii. Smart Internet Technology CRC

Smart Internet 2010 is a major project within the User Environments program. Smart Internet Technology CRC was established in June 2001. Participants include leading International and National corporations across ICT and other industry verticals, select small and medium enterprises, ten Australian Universities, the Government of New South Wales, and the Commonwealth Government. Smart Internet's mission statement is "***To capitalise the outcomes of world class Internet research and development for Australia***" Its focus was originally constructed around five major research and development programs – Natural Adaptive User Interfaces, Smart Personal Assistants, Intelligent Environments, Smart Networks, and User Environments. More recently the CRC has focussed on the utilisation of its developed technologies to deliver solutions to market in Health, Education, Entertainment and Financial Services.

A unique feature of this CRC is that it enables technologists and social scientists to undertake research in collaboration with industry partners, to explore Internet-related prospects and opportunities for Australia.

The prime emphasis of **Smart Internet 2010** is to try to make sense of the likely complex changes related to Internet futures from a user perspective. **Smart Internet 2010** integrates human factors with key technology frameworks for the future.

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OF TASMANIA

iii. Project Team

The conceptual framework and qualitative research of this report was originated by social science researchers at Swinburne University of Technology in Melbourne on behalf of the User Environments program of the Smart Internet Technology CRC.

Principal authors:

> Professor Trevor Barr, Project Manager
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Editorial advisors:

> Associate Professor Ann Knowles, Swinburne University of Technology
> Professor Susan Moore, Swinburne University of Technology

iv. The Research Investigation

Smart Internet 2010 offers an analysis of the way the Internet might evolve from the perspective of its end-users in the coming years. The prime research questions being addressed are:

- **What might the Internet be like in 2010?**
- **What positions are taken by different people and institutional interests about the future of the Internet?**
- **What are the possible outcomes for end-users towards 2010?**

The report has been compiled by researchers of the User Environments program team based at Swinburne University of Technology of the Smart Internet Technology CRC. Major contributions were also sought from other researchers within the CRC from several other Australian universities, and from some senior members of the corporate sponsors. Expert opinion from other contributors was also sought from external contributors to this project, and expert other opinion was drawn upon in interviews.

Smart Internet 2010 is written for several audiences — the general public, researchers, and corporate sponsors of the Smart Internet Technology CRC. *Internet Futures: User Environments* is a set of working notes compiled for the preparation of *Smart Internet 2010* and is only available on request to sponsors and researchers within the Smart Internet Technology CRC.

The project examines how end-users might interact with the many possible Internet innovations during the next few years. It explores the possible benefits that may follow for the users, as well as examining likely major changes for the Internet as a whole by 2010. The approach to the report was designed in part to provide CRC stakeholders with models of future patterns of user needs that could influence new product and service development.

This report was also designed to provide valuable insights for sponsors to enhance their understanding of the business and social environment towards 2010. It was also developed with the intention to act as a vehicle for the integration of research projects within the CRC.

Smart Internet 2010 explores future possibilities for Australia in Open Source and social network technologies, eHealth, digital games, voice applications and mobiles. It identifies possible outcomes that are relevant to innovation strategies and sectoral development. *Smart Internet 2010* also synthesises rich insights from overseas interviewees who are 'thought leaders' in their respective domains, and includes relevant coverage of global and industry trends.

v. Conceptual Framework: Schools of Thought

The project team does not pretend to be able to predict the future. However, it has examined a range of key social, economic, cultural, and technological variables that are most likely to be important forces for change in the next few years in the context of possible changes to the Internet in the future. Although several different approaches were canvassed for this project it was decided on the basis of considered advice that the prime framework would *not* be either quantitative forecasting, or scenario based planning. Instead, a conceptual model about the construction of Schools of Thought was chosen.

Essentially a School of Thought distils the rich insights of expert opinion within a particular field in a way that provides integrated common thinking. In this project each School of Thought offers different visions of possible futures for the Internet. Each reflects a viable 'living strategy' for a group with largely shared norms in the contemporary information and communications environment.

Schools of Thought are not written as creative original narratives or scenarios of possible futures, but as alternative critiques that outline positions held by the adherents suggesting possible future outcomes. A School of Thought ought to be viewed as a *constellation* of individuals with shared mind-sets rather than as a tightly-knit group.

One value of the Schools of Thought is that they ought to challenge conventional 'groupthink' (Irving Janis) and offer multiple mind-sets about the way things might eventuate in communications in 2010. Telstra Research Labs, a CRC Partner, draws upon this process to inform its innovation and planning strategies.

Communications Futures (CF) frameworks provide the Smart Internet Technology CRC with a strategic perspective that enables projects to track international trends, scope Internet futures, examine user needs, and forecast or design new applications and services. Sceptics who reject the value of Communications Futures work are invited to offer their alternative approach as to how the major players in ICT who are making huge new capital investments for networks, sometimes in the order of billions of dollars, might best do their strategic planning and thinking for the long term.

The authors and editorial team of this report have attempted to make sense of the Internet's competing narratives, practices, and technological breakthroughs by grouping these perspectives across four interconnected 'Schools of Thought'. This conceptual framework has been developed as an interpretive tool that acts to reveal the positions, assumptions, biases and insights from a range of leading thinkers.

The editorial team for this project has constructed four original Schools of Thought:

> **1. Adaptive User Environment**
> **2. Not The Smart Internet**
> **3. Rich Media**
> **4. Chaos Rules**

Each of the four schools is a conceptual lens that articulates the driving forces for change, and leading actors within; i.) its own school, ii.) the Internet space, and iii.) the global system within which these dynamics take place.
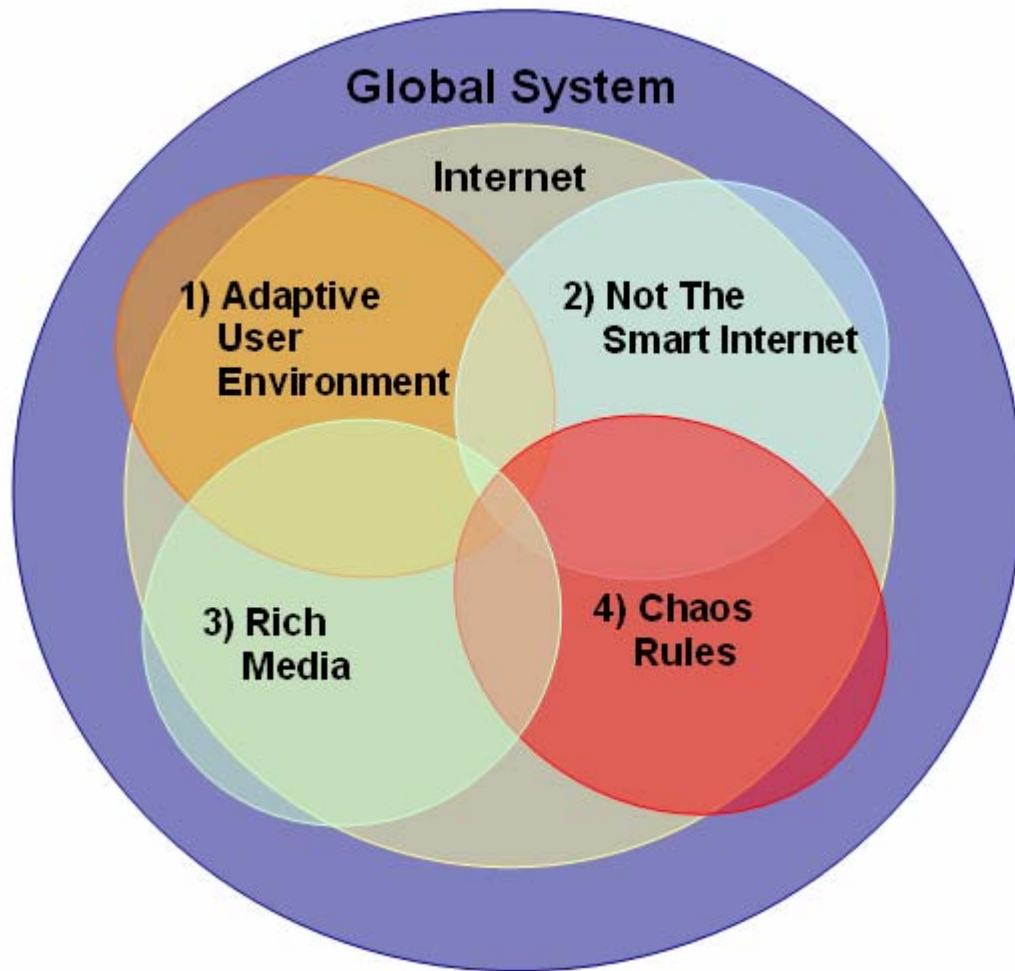
Four Schools of Thought

vi. Research Methodology: Interviews

A significant aspect of the originality of this project is that it drew upon different sets of expert opinion that offered rich insights into the possible future of the Internet towards 2010. The wide range of people consulted included technologists, academics from a wide range of disciplines, select commentators, journalists, entrepreneurs, policy makers, investors, and consumer advocates. Many of the interviews were conducted especially for the project, but in some cases an interview highly relevant to the project was drawn upon from another source. All commissioned interviews, and the select sources of interviews used, are fully acknowledged.

Commissioned Interviews

Paul Boustead (University of Wollongong, Smart Internet Technology CRC)
Danah Boyd (University of California Berkeley, social networks researcher)
Stowe Boyd (Corante Business Intelligence)
Charles Britton (Senior Policy Officer, Australian Consumers Association)
Roy Christopher (FrontwheelDrive.com)
Tom Dawkins (Vibewire.net, and ElectionTracker.net founder)
Rachael Dixon (General Manager, Massive Interactive)
Cory Doctorow (Electronic Frontier Foundation)
Mark Finn (Swinburne University of Technology)
Brian Fitzgerald (Head of Law School, Queensland University of Technology)
Terry Flew (Queensland University of Technology)
Robert Freiden (Pennsylvania State University)
Martin Gibbs (University of Melbourne, Smart Internet Technology CRC)
Cecily Gibson (Senior Action Group Eastern Shore)
Kas Kalba (Kalba International)
James A. Larson (Intel Corporation, W3C Voice Browser Working Group)
Olof Lundberg (Former CEO Inmarsat and ICO)
Richard Metzger (The Disinformation Company)
Kathy Mueller (University of Melbourne, Television Producer)
Ernie Newman (Chairman, International Telecommunications Users Group)
Mark Pesce (AFTRS, VRML co-creator)
Mark Poster (University of California)
Howard Rheingold (Author of *Smart Mobs*, and *The Virtual Community*)
Evelyn Richardson (Executive Director, Game Developers Association of Australia)
David Rooney (University of Queensland, ACRO)
Douglas Rushkoff (New York University)
Katie Salen (Parsons School of Design, GameLab)
Christine Satchell (RMIT, Smart Internet Technology CRC)
Barry Saunders (IndyMedia, NewsLab)
Stewart Smith (Linux Users Group of Australia)
Richard Stallman (Free Software Foundation)
Peter Waters (Partner, Gilbert and Tobin)
Marcus Westbury (This Is Not Art founder, NextWave Festival)
Eric Zimmerman (GameLab, International Game Developers Association)
Con Zymaris (Open Source Industry Australia)

Significant Secondary Sources

Albert-László Barabási (University of Notre Dame)
Yochai Benkler (Yale Law School)
Manuel Castells (University of California, Berkeley)
Edward Castronova (Indiana University, Bloomington)
Clayton M. Christensen (Harvard Business School)
Roger Clarke (Xamax Consulting)
Peter Drahos (Professor of Law, Australian National University)
Jeffrey L. Funk (Hitotsubashi University, Japan)
Sohail Inayatullah (University of the Sunshine Coast)
Leonard Kleinrock (University of California, Los Angeles)
Robert Laubacher (MIT Sloan School of Management)
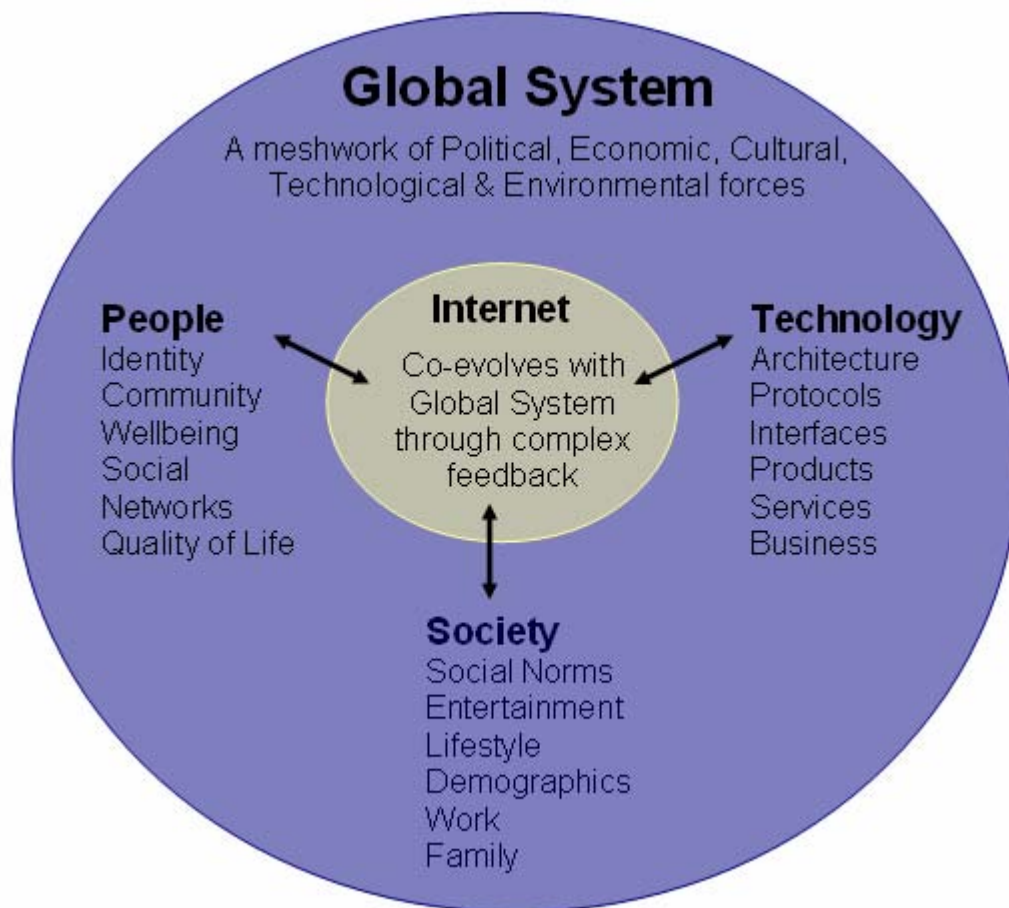Charles Leadbeater (Writer)

Lawrence Lessig (Stanford Law School)
Thomas Malone (MIT Sloan School of Management)
Geoffrey Moore (The Chasm Group)
Bonnie Nardi (University of California, Irvine)
Donald Norman (Nielsen Norman Group & Northwestern University)
Vicki O'Day (Xerox Palo Alto Research Center)
Tim O'Reilly (Founder and CEO, O'Reilly Media)
Eric S. Raymond (Author, Open Source Initiative)
David P. Reed (MIT Media Laboratory & HP Laboratories)
Everett M. Rogers (Author, *Diffusion of Innovations*)
Clay Shirky (New York University, Interactive Telecommunications Program)
Richard Slaughter (Foresight International)
Siva Vaidhyanathan (New York University)
David Weinberger (Author, Fellow at Berkman Institute for Internet & Society)
Barry Wellman (Netlab, University of Toronto)

vii. The Internet and Social Change

Janet Abbate's seminal work, *Inventing the Internet* (1999), argued that the Internet's history as a communications medium was "not inherent in the technology; it was constructed through a series of social choices" (p. 6). Originally intended to allow scientists to overcome the difficulties of running programs on remote computers, the Internet became something different. For Abbate, the "current commercially run, communication oriented Internet emerged only after a long process of technical, organizational, and political re-structuring" (p. 2). She points out that the very notion of what the Internet is – its structure, its uses, and its value – has changed radically over the course of its existence. The primary constant is that the Internet is, has been, and will remain, a product of its social environment.

The *Smart Internet 2010* research team employed a systems metaphor to capture the complexity of forces and actors shaping the development of the Internet space. Systems theory reveals that complex social systems undergo change that is dynamic, non-linear and self-organising, making it difficult to pinpoint causal relationships, and impossible to predict future trajectories.

The Internet space is a complex adaptive system in a state of continuous formation. It is constituted by the people that co-create it, the technology that defines it and the society within which it is situated. This project sets out to track how the users of the Internet are engaged now, and will remain so in the near future, on the next stage of re-inventing the Internet. From this vantage point the Internet is progressively emerging as a platform with the capacity to enable people to 'get on' with their lives.

Global System
A meshwork of Political, Economic, Cultural, Technological & Environmental forces

People
Identity
Community
Wellbeing
Social
Networks
Quality of Life

Internet
Co-evolves with Global System through complex feedback

Technology
Architecture
Protocols
Interfaces
Products
Services
Business

Society
Social Norms
Entertainment
Lifestyle
Demographics
Work
Family

The domains selected for this project were seen as important sites of social, economic and technological transformation towards 2010. Understandably, decisions about commission and omission were difficult.

In line with the broader aims of speculating on the contours and patterns of the Internet 2010, the 'exemplar chapters' have been thematically grouped into three subject areas; *People, Technology and Society.*

The first section *People* explores the domains of 'Understanding Users Towards 2010', 'Social Networks' and 'Patient-centred eHealth'.

The second *Technology* looks at 'Open Source' and 'Voice'.

The third and final section investigates *Society* through developments taking place in 'Digital Games' and 'Mobility'.

Each of these domains stands alone as a detailed research study that can be read separately.

The Schools of Thought framework adds new layers of meaning to each chapter by revealing the relationships between the multitude of actors, institutions and discourses shaping the future of the Internet towards 2010.

viii.) Executive Summary

The *Smart Internet 2010* team developed a qualitative conceptual framework based around four Schools of Thought. The overriding theme across these Schools of Thought is the range of possible futures of the Internet from the users' perspective. They are designed to scope the multiplicity of views about the way the Internet might be by the year 2010, and to highlight strong differences of opinion. Schools of Thought differ from econometric forecasting and scenario planning by drawing upon the richest insights from experts, specialists and participants working in the Internet space. These Schools of Thought are written for decision-makers, product developers, strategic analysts, and members of the CRC research community.

Smart Internet 2010 is not pitched towards conventional strategic planning, but rather, offers a set of rich insights for the future as a vehicle for strategic thinking about the future of the Internet.

The editorial group came to a collective position on many issues and opportunities related to the future of the Internet. Where a particular position is drawn upon from a contacted source during the conduct of the research a clear acknowledgement is made. The more generic comments are offered on behalf of the editorial group.

1.) Schools of Thought

Smart Internet 2010 has constructed four Schools of Thought: Adaptive User Environment, Not The Smart Internet, Rich Media, and Chaos Rules. Each has champions and exemplars who articulate and promote its unique perspective. Each School of Thought is written in an accessible and engaging way to enable widespread participation in these key debates about the future of the Internet.

In summary these are the positions taken regarding the Internet towards 2010 within each of the four Schools of Thought:

a.) Adaptive User Environment
An overriding assumption here in the context of the Internet for 2010 is that those creators, suppliers, and service providers who invest in understanding the complexity of human factors, and who apply their knowledge about the end-user interaction with the Internet, are generally the most likely to succeed. The best new technologies and services will be those that are created, designed, constructed, and marketed in ways that will be highly *adaptive* to human needs in the Internet environment of 2010. A shift in thinking is now underway to conduct social and cultural investigations into the wider contexts of usage in which communications occurs. Critical factors that now drive uptake decisions are whether the prospective services enhance a person's lifestyle, and/or fulfil personal needs, and whether the service is cost effective and affordable in the long term. So investigations should move 'upstream' and into the conceptualisation stage rather than 'downstream' at the testing stage. This paradigm puts the users at the centre of the development thinking.

b.) Not The Smart Internet

The proponents of this School of Thought advocate that a simple, user-friendly, and culturally appropriate Internet is the best option by the year 2010. The title, 'Not The Smart Internet', sets out to challenge advocates who wish to build a new array of technologically driven Internet applications, some of which may be based merely upon their 'smartness' or the 'quick fix'. Rather, what is more important is a functional, low-cost Internet that hides operational complexity and meets the social and communication needs of its users. Proponents of this School view most technologically advanced devices to access the Internet as little more than expensive systems that lock users in to walled gardens of proprietary standards and preferred partner agreements. They advocate open standards for audiovisual content and devices for the future and are critical of products that tether users to narrow service offerings. It may be better in the future to concentrate on addressing the shortcomings and problems related to the operation of the present Internet rather than investing in, and building, a new Internet for the elites. We need an Internet that offers basic services for all.

c.) Rich Media

This School of Thought is primarily driven by technological innovation in a world where there are a plethora of devices, applications and services feeding off the Internet by 2010. Its members are not inherently deterministic in their approach to 2010, but are increasingly aware that 'smart' also means that technology innovation has to be developed within a context of relevance and usefulness to a diversity of markets, people, contexts, and places. Increasingly personal communications have shifted away from a paradigm of a single person using a single device, to a multi person/multi device scene where people use an array of devices - i.e., a desktop pc, a laptop pc, a personal digital assistant, a mobile phone, and an MP3 player. And in a rich media environment, more and more people are able, and also can afford, to access the Internet, via a workstation, mobile phone, a PDA, or some other appliance. Therefore, as we approach 2010, more and more people will access a wide array of Internet based services irrespective of their dependence on a particular technology or a certain mode of connectivity. It's the 'any content, any device, any format, anytime' paradigm for the Internet by 2010.

d.) Chaos Rules

This School of Thought is primarily concerned with an Internet in the future that may be in a continual state of decay and worsening disorder. Chaos is defined here in a variety of ways. 'Chaos' is a contested concept. Microsoft's Bill Gates contends the Open Source (OS) software movement is 'chaotic' and threatens the free market. OS advocates Richard Stallman and Cory Doctorow counter-argue that Microsoft's oligopoly and software design processes are the key underlying problems. Exponents of this School of Thought widely share a sceptical pessimism about the robustness of Internet services that may be ruined by 'spam' junk emails, rogue hackers and viruses. They distrust the utopian visions of a 'high-tech' society because an over-reliance on information technology also creates pathologies and vulnerabilities. Chaos Rules advocates believe Internet futures will be dominated by a negative utopian vision they describe as Digital Dystopia. The root cause of this vision is the Internet's chaotic and decentralised nature as a communications infrastructure. The extremists argue that some of the problems can never be solved and that the Internet may collapse by 2006.

In summary those insights and possible outcomes for the Internet towards 2010 appear below.

2.) The Internet *In* Society 2010

- In the year 2000 the Internet was seen to be ushering in major business and social changes as the *'father of all disruptions'* during the dotcom boom (i.e., shopping malls would close to be replaced by the coming ubiquity of online shopping and e-commerce). Some commentators then postulated the notion of re–labelling our society as 'the Internet society'. Subsequently much of the thinking has shifted from such all encompassing macro predictions of change i.e., the Internet will change everything, to more realistic and micro senses of change for the Internet of 2010.

- Rather than discussing 'the Internet society', we need to work towards understanding the role of the Internet *in* society. Canadian social network analyst Barry Wellman has charted this evolution of the Internet as a social phenomenon, showing how it plugs into existing social structures and maps onto everyday life.
The Internet by 2010 is likely to emerge as a more **user friendly, more accessible, indispensable lifestyle communications tool.**

- The Smart Internet of 2010 is likely to become *'the platform for personal connectedness'*. Increasingly towards 2010 more and more users will want to access, and increasingly be prepared to pay for, the connectedness that provides them with their own choices of music, film and video selections, the capacity to exchange specialised peer-to-peer services, and the opportunity to express themselves through digital games. Also likely in terms of connectedness, is the emergence of an enhanced range of personal corporate services, especially in finance and banking. In short, the user paradigm will shift away from people merely accessing professionally produced content to using the Internet as a platform for personal connectedness. Hence the process of an 'always-on', co-created Internet experience through social networks, takes on new significance.

3.) Nomadicity, Embeddedness and Ubiquity

- Leonard Kleinrock, a distinguished long time Internet pioneer, has offered his special vision for the rich media of the new Internet. He talked of **nomadicity** where 'Internet nomads' can access services by moving from place to place in a way that will be "transparent, integrated, convenient and adaptive." He talked of **embeddedness** where small intelligent devices embedded in the physical world are connected to the Internet. The web of the future, for Kleinrock, will present links and information via natural language speech, video, images, eyeglasses, displays, holograms, and other human centred interface technologies.

- Leonard Kleinrock's overly optimistic prediction about **ubiquity** – i.e., that Internet services will be available wherever the nomad travels globally – is highly desirable but unrealistic for the near term. Examination of United Nations (UN) and International Telecommunications Union (ITU) data would lead to a more realistic conclusion that on a global scale the vision of 'any-to-any connectivity' is most unlikely to be realised by 2010. The notion of the digital divide, based on projections from the World Summit on the Information Society (WSIS) & World Bank data, however, is likely to narrow faster globally towards 2010 for mobile communications than for the fixed line telephone and for access to broadband services.

- It is likely that software agents will emerge by 2010 that provide software that is personalised, knows the users' interests and habits, and performs tasks it thinks useful to support the user. Call centres may progressively advance the development and utilisation of spoken, natural interfaces which in some instances offer comfort zones for particular users.

As speech becomes a more common form of input and output to any machine by 2010 it will be critical that it be based on non-proprietary core building blocks.

4.) Disruptive Technologies

• Clayton Christensen's notion of 'disruptive technologies' – i.e., those that can 'disrupt' industries, unleash innovation in firms and offer differentiation in the range of products and services – is likely to lead to significant modification of the Internet by 2010. Important changes in the marketplace will continue to be driven by users' preferences and create structural institutional disruption i.e., peer-to-peer services (music and film), Voice over Internet Protocol (VoIP), disintermediation (travel) and reintermediation (financial services). Such changes are likely to have profound long term consequences.

• In the preparation of *Smart Internet 2010* an overview was often put that "we don't want more and more technology for the future–we need communications services that will help people run their lives." The best Internet based applications towards 2010 will not necessarily succeed because they offer higher levels of technology performance, but because they are seen as being practical and affordable to consumers with obvious usefulness in their lives, sometimes as 'low tech/low touch' applications.

• One of the development issues that emerges out of the debates surrounding disruptiveness is whether supplies and developers need to think more in the future in terms of *adaptation* than originality of creation. Robert Morsillo, Group Manager, Consumer Affairs, Telstra, offered the view:

"Technologies are often constructed first and foremost for an elite group of users and only afterwards diffuse into and become adopted by a broader community. While a technology, such as the plain old telephone service (POTS), may now be adopted by the vast majority of Australian households, it is quite possibly an "alien" artefact for others, including for remote Indigenous communities. The challenge, then, is to determine whether *alternative technologies* may be possible, and to determine what *adaptation* may be needed in the existing technology, and/or in the supplier's processes and procedures, and/or in the user group, to achieve better (communications) outcomes".

5.) A Medium Of Its Own

• Douglas Rushkoff noted that "we haven't really created a medium indigenous to the Internet yet", but suggested that the forthcoming changes would be about major shifts away from text and towards video. He further commented that: "I think literacy and everything that goes along with it; cause and effect, abstract thinking, fragmentation, individuality are all things that are going to submerge as a more non-linear understanding of the world emerges."

• Stowe Boyd argued that in the future the Internet would shift away from belonging with the personal computer. He argues that "high powered mobile devices and ubiquitous connectivity will shift the Internet away from being a PC experienced domain, and we will see an enormous shift away from slow-time interaction via reading and writing web pages, toward real-time interaction (a la IM, VoIP, and increasingly video). In 2010, 50% of everything being put on the web will be the record of real-time interactions."

• Howard Rheingold suggested that "the oversimplified way to look at it is that in 2010 we could have a very rich cultural and intellectual and political medium online, with millions of producers as well as billions of consumers -- in music, instead of one or two

megastars who make billions for their global companies, there will be hundreds of thousands of garage bands, each with its loyal constituency of a few thousand. We'll see people building on each other's work and transforming media."

6.) The Mobile Internet

- For Danah Boyd ubiquity is the key. She argued: "I can be wherever, whenever and access information at my fingertips. This will be done through a mobile handheld. The computer will be resigned to be that which we produce text on. Communication technologies will be fractured by trusted networks. Instant messaging will be the primary tool of communication of the new workforce and there will be a generational divide. Basically, it's what we're already seeing... only mobile is key."

- The growth of '*texting*' and next generation mobile phones has created the space for a range of social interactions to occur beyond the place-boundedness of the home, office or school. Mobile digital lifestyles will create new forms of social interaction as fluid, network-enabled *swarms* of users exploit technology to coordinate group action, collaborate, create and exchange content at an unprecedented scale and speed.

- Some innovations representative of *mobile futures* include:

a.) Location-based services that allow users to coordinate activities with their social network via mobile phones and other hand-held devices. These tools give users the power to meet-up offline in a spontaneous fashion by alerting members of affiliation groups (family, friends, work colleagues) the whereabouts of relevant parties via a mobile messaging service. These applications also have the potential to be used for pull marketing by service providers (restaurants, tourist attractions) and provide content to augment places of interest (maps, city guides, search).

b.) The convergence of mobile devices, digital cameras and weblogs (web diaries) has led to the emergence of 'moblogging'. This growing trend sees users take pictures and automatically post the content to a weblog from their mobile phone. Moblogging represents the configuration of disparate tools that allows user-generated content to be instantaneously shared with a global Internet audience. Moblogging has been used at trade shows to reveal new products, as a means of documenting social activities with remote audiences, and has become part of the wider 'citizen journalism' movement.

c.) Following the success of peer-to-peer (p2p) file-sharing, mobile phone companies have begun prototyping mobile p2p applications that will give users the ability to exchange content on the move. Improvements in network and handset capabilities will see mobile p2p used by anonymous, globally distributed users to share, swap and trade music, movies, games and other user-generated content via increasingly sophisticated mobile and hand-held devices.

- The state of mobile Internet in 2010 will be greatly influenced by the collective actions of carriers, equipment manufactures, content providers and users. Critical areas for resolution are the development of industry wide interoperability standards and design systems that enable both post-paid and pre-paid callers to participate in mobile innovations.

7.) Stakeholder Product Innovation

• A new product development paradigm has emerged regarding possible new Internet based applications and services which is likely to be extended towards 2010. Put simply, we have come from an era since the mid 1990s of an Internet developers' playground and have now moved into a communications environment that has become increasing driven by the complexities of users preferences, both commercially and socially.

• Andrew Odlyzko of AT&T Labs has argued that the 1990s development phase of the Internet and the personal computer, especially with Microsoft's dominant operating systems, were superb at serving developers, and reasonably good at serving the early adopters, or the 'power users' as he called them, but overall development "was not optimised for the bulk of end users." The Microsoft development computing model of the great 'killer application' of the 1990s will not be replicated for the Smart Internet of 2010. Instead, the applications innovation process will be less corporate-driven and much more about small scale adaptation, mixing and matching, and providing solutions to problems for users.

• The contemporary development phase of the Internet has seen the unexpected emergence of applications that are driven by users, such as email, text messaging, Google's PageRank™, collaborative filtering and peer-to-peer services, initially with music. None of these successful Internet based innovations were planned or foreseen by the major business stakeholders. These innovations emerged from a demand driven/user needs paradigm rather than a supply driven business model. This development phase is expected to be more enhanced towards 2010 – an era of the adaptive user environment. The emergence of this phase raises many issues about new institutional practices about product and service development.

• Newer thinking about the human factors in product development has shifted away from functionalist usability testing towards attempting more to capture social and behavioural knowledge early in the development design cycle.
John Fabre of Telstra suggested:

"When it comes down to deriving technology solutions based around identity, privacy and trust, social science research literature has been empirically lacking, business analysis have been speculative, and solution designers have opinionated around technologies. This is problematic when customers are the epicentre of a business. This assumes that services and delivery of services should be tuned to address business outcomes (revenue) and fit into the way customers 'live'. The latter means fitting in with human behaviours that are inherently adaptive (will work with, despite lousy technology), perceptions of the world (necessary so that the world appears rational and orderly). This research is partly motivated by the belief that, knowing how customers navigate their perceptive world informs us as to how they reason about what they do, particularly, when they are required to trade off risk and value when using various channels of communication (online, mobile, etc.). If this knowledge is captured early enough, it has the ability to inform more high level design decisions when project teams come together to consider how technologies could be assembled to meet a service need. This research will not stop solution definition, but it will make you think about limitations and features which a product should support in a socially communication-rich world."

8.) Domains Towards 2010:

Digital Games

- 'Player-producers' and social networks will empower Internet gaming and create hybrid genres to 2010. Microsoft and Sony's new consoles integrate 'player-producers' and e-commerce capabilities but pressure remains on developers to resolve IP issues. By 2010 'player-producers' will have 'crossed the chasm' from fandom (community of fans) to mainstream games development. This shift will revolutionise game design tools, develop Open Source games systems, deepen the cultural context, and unleash 'sustaining' innovations, according to Katie Salen and Eric Zimmerman.

- Digital culture will provide rich future contexts for videogames development. It synthesizes aesthetics and ideas from computer science, avant-garde art, critical theory and the new academic discipline of games studies. Digital culture provides a collaborative space for digital lifestyles, creativity, and user-driven innovation. It generates complexity and novelty via fans, subcultures and open systems (Katie Salen and Eric Zimmerman). The 'play ethic' also creates new synergies with other creative industries.

- New critical perspectives may resolve the videogame violence debate. 'Immersive' technologies and the creativity of 'play' partly explain the addictiveness of some videogames. Violent imagery remains popular due to 'high concept' industry pressures and the collective failure to imagine alternatives. Massively Multiplayer Online Games, for example, enable collaborative virtual teams and intergenerational dialogue.

- The Australian videogames industry faces critical barriers to remain internationally competitive to 2010. It needs an integrated national strategy, access to venture capital and entrepreneurial managers, R&D tax incentives for Australian content, education pathways that simulate industry practices to develop an 'incubator' model for university-industry collaboration, and for more participants to adopt Agile/eXtreme project management techniques.

Entertainment Services

- Marketplace shifts and new modes of distribution are significantly undermining the established 'top down' broadcasting model. The new era of rich media will radically change the broadcasting landscape and will disintermediate the traditional distributors of audiovisual media, directly connect producers to consumers, and erase the hard definition between producers and consumers. Peer-to-peer superdistribution, what Mark Pesce refers to as **'hyperdistribution',** is a likely future pattern of distribution. This will liberate consumers from the anti-market forces of free-to-air commercial networks and program distributors.

- Broadband **'peercasting'** technologies, and the possible 'death' of television spectrum broadcasting, makes Open Source Television (OSTV) a disruptive technology of the first order, according to Mark Pesce. 'Peercasting' is more efficient on a global scale in terms of distribution than the broadcasting model, and it shifts the balance of power from producers to consumers. Progressively towards 2010 consumers who can afford access to this emerging distribution platform will be able to decide what they see, when they see it, and how they see it. This will be an important component of 'connectedness' within the new entertainment domain.

eHealth

• Australia's eHealth landscape faces challenges to 2010 that include cost increases for care delivery, shortages of healthcare professionals, and demographic pressures. The Smart Internet Technology CRC recognises that user-centred design (UCD) insights are crucial for designing and implementing robust eHealth systems that can 'do more and better with (relatively) less', by understanding patients rather than short-term reliance on technology fixes.

• The CRC's model expands the eHealth domain from interactions between healthcare professionals and patients to include those between patients and devices, applications and services that empower patients to become active participants in managing their own healthcare. The CRC's model has three dimensions: prevention (using 'smart' technology to help users manager their healthy lifestyles); maintenance (helping patients with a health condition to live independently in the home and community); and empowerment (enabling patients to become more active and responsible in decision-making about treatment and care). The CRC also prioritises the needs of people with disabilities; the elderly, and the chronically ill (including young people).

• The CRC conducts research, development and commercialisation of notable eHealth solutions. These include: mobile and personalised devices, applications and services that enhance patients' care management; home based intelligent environments that monitor patients and are linked to care providers; and community based intelligent environments that integrate tele-medicine, virtual healthcare services and community self-help groups.

Banking and Financial Services

• Paradoxically, online banking and financial services are likely to grow steadily in Australia, despite widespread stated concerns about security and privacy issues, and overriding reservations by users about the lack of trust in the Internet as a platform. There also appear to be changing attitudes towards privacy within particular groups. For example, the 24/7 obsessive workers now appear willing to offer to suppliers a great deal of their personal information which hitherto they were reluctant to release to companies to store in their databases. Where the communication service offers a quick, convenient way of processing transactions, members of the 24/7 brigade appear to be willing to trade off more risks than ever before.

9.) Social Networking

• A new phase of Internet services is emerging from a combination of factors including a mature web infrastructure, the emergence of web-native platforms like Blogs (personal web diaries), Wikis (web pages any user can edit), social networks and increased access among user groups, according to Clay Shirky.

• Social networks have the potential to move beyond simple dating and referral services to become a significant application for the mobile digital lifestyle. By incorporating location-based technologies users will be able to determine the proximity of friends of friends, seamlessly exchange pictures, music and movies through mobile blogs and engage in 'peercasting' using novel combinations of these networked multimedia. These fluid socially networked interactions will accelerate and amplify information sharing, and in doing so alter the nature of work, family life and the economy.

- The power of social networks enables users to embrace the 'collective intelligence' of their surrounding social environment. Early adopters have begun a move away from traditional media sources to rely on trusted sources in their network of friends, family and fellow travellers for reviews, feedback, and advice about the latest product or service. By 2010 these empowered consumers will form ad-hoc lobbies with formidable power to influence the fate of brands, companies, and products that fail to deliver value, quality, and maintain ethical standards.

10.) Open Source

- Open Source software provides the infrastructure for dispersed teams of programmers to collaborate, enables the development of customised solutions and provides low-cost alternatives for business and the public sector. The success of Open Source will continue, as more organisations recognise that 'cooperative models' of production can be employed at the enterprise level, without diminishing for-profit business models.

- Open Source and p2p filesharing will continue to ignite legal disputes and highlight the need to balance economic reward with freedom of expression in an 'information commons'. Changes to Australia's Intellectual Property (IP) legislation arising from the 2004 Australia-US Free Trade Agreement (AUSFTA) will continue to be a major source of tension. Australia's creative industries and consumer groups will maintain opposition to any strong IP regime that imposes harsh penalties on the fair modification of copyrighted content, devices, and applications.

- The Creative Commons movement provides the legal and cultural mechanisms for the expansion of the Open Source model beyond software, and provides opportunities for content producers to gain control over the use of their products in a variety of contexts. Creative Commons type initiatives could catalyse the birth of a parallel creative economy. This would give producers the ability to engage directly with each other's material, and their audience, leading to new forms of collaboration and the development of innovative cultural products.

- The flowering of Open Source software, DIY media and 'remix culture' will see the rise of professional-amateurs (pro-ams) whose practices form new modes of production, distribution and exchange in areas of software (Linux), game development (Ultima Online), film (Machinima), radio (podcasting) and knowledge production (Wikipedia). The Open Source model of collaboration provides 'pro-am' groups with the ability to work flexibly, for the advancement of knowledge and the pursuit of social capital.

- Together Social Networking, Open Source and p2p will disrupt more areas of social life as users self-organise to form "communities of practice" with other like-minded individuals. These highly adaptive swarms will force media and entertainment monopolies to re-evaluate value creation, change politics through blogs and Smart Mobs (Rheingold), impact business through boycotts, and develop new modes of innovation through what Benkler describes as 'commons-based peer production'.

11.) Users with Special Needs

- *Smart Internet 2010* has the potential to greatly enhance the lifestyle of people with special needs. Harold Hartfield, of the Australian Federation of Disabilities Organisations, argues that the Internet by 2010 could be "a truly empowering medium of communication", as accessing information by the Internet becomes *enabling in life as opposed to disabling*. He argues that video streaming over Internet Protocol, with high speed broadband presents the deaf community with real time communication via their own language, Auslan. Similarly, the blind and vision impaired, with suitable adaptive screen reader technology, can access information via the Internet like any other Australian. For Australians with serious dexterity issues, voice recognition technology provides independent access to the Internet, and this ought to help many more people in the near future. Equitable access to the Internet for people with disabilities, however, necessarily involves two essential components–affordability and the right adaptive equipment.

12.) Putting Users First

- The overriding conviction which underpins *Smart Internet 2010* is that users ought to be central to strategic thinking about what kind of an Internet might emerge by the year 2010, and how related innovation is best fashioned. This viewpoint is made in the multiple contexts of commercial, economic, social and cultural perspectives. A broad range of human factors must be analysed to gain a better understanding of those that influence the take-up of new communications technologies and services. Some of the most important human factors are cultural and lifestyle determinants; issues relating to user needs and usability factors; perceptions of affordability and long term value; and how users trade-off risk and value when making decisions about various channels of communication.

- The Internet has emerged relatively recently to become the premier communications platform, offering diverse services and extraordinary communications capabilities. Its richest potential is that eventually global 'any to any connectivity' may be realised for the benefit of most humanity. This connectivity will provide an infrastructure required to deal with civilisational complexities, to support awareness of cross-cultural dialogue, and to develop a truly global consciousness for the 21st century.

I. Schools of Thought

1. Adaptive User Environment

2. Not The Smart Internet

3. Rich Media

4. Chaos Rules

Introduction

The intention in constructing the four Schools of Thought was to outline and scope the vast array of different positions held by people, and institutional interests, about the possible future directions of the Internet. Schools of Thought are useful conceptual tools to organise the considerable diversity of views and expert opinion sought for this research project. No School of Thought is tightly self-contained with a defined boundary, and some protagonists could fit with their different views within multiple Schools. The purpose of this framework is to set the opening context of this report, and lead into an examination of a set of possible outcomes relating to the future of the Internet towards 2010.

School of Thought 1: Adaptive User Environment

Proponents of this School of Thought focus on how social and cultural factors influence the way end users and consumers interact with a wide range of Internet-based technologies and services. The related product development and investment questions are concerned with how Internet based technologies are actually used in practice, and how greater understanding of the human factors can be developed and used to enable widespread acceptance of applications and services for the future. An overriding assumption in the context of the Internet for 2010 is that those creators, suppliers, and service providers who invest in understanding the complexity of human factors, and who apply their knowledge about the end-user interaction with the Internet, are generally the most likely to succeed. The best new technologies and services will be those that are created, designed, constructed, and marketed in ways that will be highly *adaptive* to human needs in the Internet environment of 2010.

This position invokes relatively new thinking. For much of the twentieth century it was essentially possible for a supplier to roll out a telephony network and find that the introduction of a telephone service had a natural take up by consumers. Progressively, the telephone became an invaluable social and business instrument. However, the old paradigm of telecommunications development - 'build the networks and they will come'- has changed since that era of limited services. Similarly, the old assumptions about computing development – 'there will always be enough users to fill the increasing bandwidth' –have gone. The present communications environment in developed economies has a plethora of information and communications services, of different kinds, that requires difficult advance judgements to be made about the possible acceptability of new products and services by users and consumers. Underpinning so much recent change related to the Internet is a new and much more complex value chain in communications.

The development of so many innovative communications services means that organisations who invest in new communications services need to undertake greater investigation of the place of communications in their lives. Participants who wish to offer services need to <u>understand user perspectives</u> as well as technology perspectives. Providers of technology have tended tend to start from a position of what they do and what they can offer, instead of starting from trying to understand how consumers and citizens might want to use technology-based services, both old and new, in their lives. Whilst it must be acknowledged that there are some significant examples of successful intuitive product development

technologists who simply 'backed their hunches' about what they thought might work in the marketplace, and who gave only little consideration to how prospective end users might respond, the proponents of this School of Thought advocate ongoing systematic investigation and application of the social, economic and cultural contexts of end users.

Human Centred Development Processes

A pioneer of the Adaptive User Environment School of Thought is Donald Norman, who headed the Apple Research Laboratories during its hey day. He was a key person in designing the original Macintosh computer and later became Professor Emeritus of Cognitive Science at the University of California. For some time Norman's central thesis has been that today's technology is intrusive and overbearing. For him "we are trapped in a world created by technologists for technologists." Not so long ago he wrote:

> The personal computer is perhaps the most frustrating technology ever. The computer should be thought of as infrastructure. It should be quiet, invisible, unobtrusive but it is too visible, too demanding. It controls our destiny. Its complexities and frustrations are largely due to the attempt to cram far too many functions into a single box that sits on the desk top. The business model of the computer industry is structured in such a way that it must produce new products every six to twelve months, products that are faster, more powerful, and with more features than the current ones. The result is that the entire industry is trapped by its own success, trapped into a cycle of ever increasing complexity from which it cannot escape. (Norman, 1999: 18)

Donald Norman's book first published in 1999 was titled *The Invisible Computer:* his sense of an appropriate title for an easily accessible, useful and friendly Internet for 2010 might be *The Invisible Internet.*

Norman's plea was for the development of information appliances that fit people's needs and lives. Companies, he argued, must change the way they develop products and implement human centred development processes:

> The traditional method of development is to follow a linear sequence, from specifications, through design, manufacture, sales and delivery, usage, and then repair, service and assistance. Marketing provides the specifications, the engineers design to meet them, then pass the design on to the manufacturing experts… Finally the sales teams are asked to sell the finished package and the service and maintenance people are trained on its operation and on the kinds of problems that are expected. This is time –tested method of development. It has led us to the complex, messy, unsatisfactory situation we are in today, especially in high technology products, where customer satisfaction is low, the cost of help lines and service high. (Norman, 1999: 211)

The Norman Conceptual Model:

'I have long maintained that the appropriate way to design a complex system is to develop a clear, coherent conceptual model (ideally the same as the designer's conceptual model) and to design the system so that the user's mental model would coincide. I had always assumed this would be done through the design of the "System Image": the artifact plus any auxiliary material, such as manuals and help systems.' (Donald Norman, 'Design as communication'). See: (http://www.jnd.org/dn.mss/design_as_communicat.html)

Conceptual Models
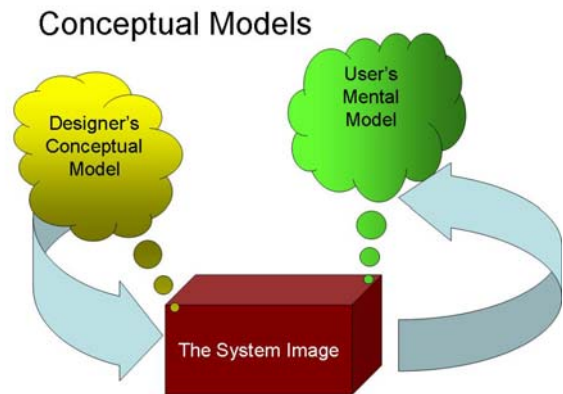
{Originally published in Norman & Draper's *User Centered System Design* (1986), and reused frequently thereafter: *The Design of Everyday Things* (1988, 2003) and *Emotional Design* (2004)}.

Communication processes fail frequently. It is astonishing how we are bombarded daily with a range of new information products and services that give such limited apparent consideration given to how consumers use, and interact with, the information product or service. The provocative article 'I can't work this ?#!!@/ thing' in *International Business Week* suggests:

> Every day, across America, millions of managers, bankers, doctors, teachers, chief executives, and otherwise highly competent men and women are driven to helpless frustration by the products around them. The great revolution in electronic products that promised so much- speed, efficiency, and yes, fun- is not delivering. Office productivity isn't going up. (Nussbaum and Neff, 1991).

This article refers to Xerox's new 8200 office copier, which was packed with loads of on board computer intelligence for collating, enlarging, and reducing copy, something that worked perfectly in the laboratory, but droves of loyal Xerox users could not make it work for them. Similarly, Ricoh, one of Japan's leading manufacturers of office equipment, found from a customer survey, that 95 percent never used the three key features deliberately built into their machines to make them more appealing.

These kinds of criticisms have led to the growth of more user centric work in communications. RMIT University's Associate Professor Supriya Singh, and a Project Leader for the Smart Internet CRC, has neatly summarized the philosophy and strategy underpinning user centric studies:

> To understand the users' perspective, the user and their activities need to be placed at the centre of the questions. The focus is on activities and the nature of communication rather than the technologies, goods and services. Information and communication technologies are studied within their social context.... Once the users' perspective has been discovered, dialogue with providers and policy makers is helping by focusing on bridging concepts, such as 'design' and 'trust'. Another

precondition is that it has to be recognised on all sides that no one perspective tells the complete story. This recognition brings all sides to the same table, even though they may not initially be having the same conversation. (Singh, 2001).

Product designers who conduct even a few usability tests are more likely to produce a better designed product than those who decide that their concept or prototype does not need to be design tested. Usability, particularly testing, and studies of human computer interaction (HCI), have now become more widely recognised in industry. As the World Wide Web became an increasingly important communications platform, a plethora of consultants have emerged to offer practical and constructive advice to facilitate better navigation within and across Internet sites. The Nielson Norman Group (www.nngroup.com) provides a good example with their advice on common web design mistakes i.e., URLs too long, overcrowded pages, small font sizes, outdated information as Linkrot, limited navigation advice, and so on. These recommendations emerged from field investigations which observed how users interacted with a wide range of particular web sites. This kind of work has its critics, however, some of whom argue that it can only operate within a limited framework of making some processes easier, or that the advice is far too prescriptive, or merely that it is functionalist in its approach.

Tom Stewart of London-based Systems Concept goes further than functionalist type usability work in his thinking:

> There is widespread confusion in industry that making a product usable is the same as making it 'easy to use'. This marginalises usability to being a bit of a luxury which, while attractive, is not essential. There is also a misunderstanding that user centred methods stifle creativity and simply invoke asking users what they want. (Stewart, 2004: 7)

Stewart suggests four main traps for unwary designers: thinking users will see the system the way they do; thinking that users are so different that they will put up with the things the designer won't; not realising that the users live in a different context/world; and not thinking about users at all. Stewart commends much of the systematic work conducted in the field of HCI in recent years that has culminated in national and international standards bodies creating "effective, efficient and satisfying frameworks."[1] For interactive systems and products, for instance, the process is described in the International Standard ISO 13407 Human Centred Design for Interactive Systems (www.iso.ch).

'Upstream' User Centred Design

Moving towards 2010, Adaptive User Environment School proponents argue that wider work will be needed than merely trying to ensure that user needs are married to good design

practices. Much of the established HCI and usability work is conducted within a framework where a product concept is well advanced, or a prototype already exists, which can then be tested on select potential users and problems highlighted. The common problems include unclear instructions, confusing steps required to reach the eventual outcome, cluttered pages, or there is no opportunity to back track and easily repeat a processes when an error is made. Though this kind of usability work is useful, it has limited value and remains highly functionalist.

A shift in thinking is now underway to conduct social and cultural investigations into the wider contexts of usage in which communications occurs. Critical factors that now drive uptake decisions are whether the prospective services enhance a person's lifestyle, and/or fulfil personal needs, and whether the service is cost effective and affordable in the long term. So investigations should move 'upstream' and into the conceptualisation stage rather than 'downstream' at the testing stage.

Moreover, though end users in the contemporary communications world are provided with more opportunities than ever via the Internet they also face unprecedented problems in their interactions with the technology - perceived and real. These include issues relating to spam, viruses, invasion of privacy, concerns about security and fraud, complexities related to identity, and their sense of trust. Whether users, individual or group, might use or buy particular services is increasingly influenced by a wider set of attitudinal variables, such as those already mentioned. Hence in moving towards the Internet of 2010, investigations that examine social and cultural factors in context with the conceptualisation phase – or 'upstream' – are seen as critical in the ways they can influence the actual development of the product or service and the eventual market take up.

British scholars in this field have come to use the term 'domestication' to explain how technologies are introduced into people's daily lives and eventually embedded into their practices and routines of everyday life. Roger Silverstone, for example, has tended to restrict the examination of the use of technology to a specific location – the home.[2] Silverstone and his colleagues centre their research on four phases of domestication: appropriation, objectification, incorporation and conversion. These phases may be summarised as follows:

    a. **Appropriation**- when a technology based product or service is sold and individuals or households assume its owners.

b. **Objectification**- when processes of display reveal the norms and principles 'of the household's sense of itself and its place in the world'.

c. **Incorporation** – when technologies are used and incorporated into the routines of daily life.

d. **Conversion** – the processes by which the use of technologies shape the relationships between users and people outside of the household.

John Fabre, of Telstra Research Laboratories (TRL), attempts to marry social and behavioural research investigations, and their 'lessons', to the development of specific product development capabilities at TRL. He discusses key aspects of this relationship:

> When it comes down to deriving technology solutions based around identity, privacy and trust, social science research literature has been empirically lacking, business analyses have been speculative, and solution designers have opinionated around technologies. This is problematic when customers are the epicentre of a business. This assumes that services and delivery of services should be tuned to address business outcomes (revenue) and fit into the way customers 'live'. The latter means fitting in with human behaviours that are inherently adaptive (will work with, despite lousy technology), perceptions of the world (necessary so that the world appears rational and orderly). This research is partly motivated by the belief that knowing how customers navigate their perceptive world informs us as to how they reason about what they do, particularly when they are required to trade off risk and value when using various channels of communication (online, mobile, etc.). *If this knowledge is captured early enough, it has the ability to inform more high level design decisions when project teams come together to consider how technologies could be assembled to meet a service need*. This research will not stop solution definition, but it will make you think about limitations and features which a product should support in a socially communication-rich world. (J. Fabre, email to CRC Researchers, 1 June, 2004)

Disruptive technologies

Some of the thinking within the Adaptive User Environment School of Thought is that the user environment for the Internet in 2010 will have significantly different marketplace dynamics to that of today. It may be a time that will see a major extension of what has been characterised as the era of disruptive technologies.

This notion is derived from Harvard University's Clayton Christensen's *The Innovator's Dilemma*, first published in 1997, and regarded as groundbreaking work about technology and entrepreneurship. He found new ways of looking at innovative companies that had created new business models with the effect of eventually changing changed 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 of these types of technologies had contrasting characteristics which facilitated different kinds of change. Christensen called his first type 'sustaining' technologies because although these were new technologies they essentially only improved performance in ways that mainstream customers in major markets had historically valued. Therefore the customers of new sustaining technologies recognised that although there was product improvement the technology was doing 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 base. Donald Norman has pointed out that by 1992 Microsoft Word had 311commands - part of what he called 'featuritis'.

The second type of technology defined by Christensen are 'disruptive' technologies, so named because they have the effect of completely undermining established business cases. These are technologies that offer little in the way of enhanced performance initially but generally appeal to consumers because of their convenience and cheapness. 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 often realise long term potential. In some instances, Christensen notes, the new technologies have 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).

Roger Kermode, formerly of Motorola, and now Director of Innovation and Technology with the Smart Internet Technology CRC, has cited the Palm Pilot as an example of a new disruptive technology:

> One example of a disruptive technology is the Palm Pilot which was technically inferior to the Newton in terms of screen size, memory, and processor speed. The reason the Palm Pilot succeeded where the Newton failed was that it focused on doing four simple tasks very well (Calendar, Phone Book, Tasks, Notes) and that it

fitted in a shirt pocket. The larger more powerful. Newton didn't excel at any one of these high value tasks, and it was awkward to carry. Put another way, the incumbent company (Apple) focused on adding features and ended up over servicing its customers by giving them more than they wanted, while the entrant company (Palm) focused on meeting a specific customer need and only that need by providing a product that was 'not good enough' in the larger market sense. (Roger Kermode, internal email, Smart Internet Technology CRC, 21 January, 2005)

The father of all disruptions by 2010 may be the Internet. It is apparent that 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 that radically alter the economics of their industry. Examples include the amazon.com – billing itself as 'world's biggest book store'– as disruptive to traditional bookstores; amazingly busy auction suites such as eBay disrupting auction houses; burgeoning cut price airlines that process flight bookings through their own web site that may eventually replace established travel agents; new distribution modes in music with peer-to-peer filesharing; and online share traders that potentially threaten the rationale for the existence of established stock brokers.

These are the 'disruptive' practices usually attributed to the introduction of disruptive technologies. Or *are* they, ask the proponents of the Adaptive User Environment School of Thought? Might not the real drive for these changes be come not from the technologies but from the end users?

Most of commercially successful innovations towards 2010 are likely to be of the disruptive kind. The best applications will not necessarily succeed because they offer higher levels of technology performance, but because they are seen as being practical and affordable to consumers with obvious usefulness in their lives as low tech/low touch applications.

This may give new meaning to the term 'user empowerment' for 2010 - and beyond.

'Adaptive User Environment' Champions
Donald Norman, Tom Stewart, Gerry Gaffney, David Sless, Brenda Dervin, Nelly Oudshooorn, Trevor Pinch, Sally Wyatt, Roger Silverstone, Christina Lindsay.

School of Thought 2: Not The Smart Internet

The proponents of this School of Thought advocate that a simple, user-friendly, and culturally appropriate Internet is the best option for the year 2010. The title, 'Not The Smart Internet', sets out to challenge designers who wish to build a new array of technologically driven Internet applications, often based upon their 'smartness' or 'quick fixes'. Rather, what is more important is a functional, low-cost Internet that hides operational complexity and meets the users' social and communication needs. 'Not The Smart Internet' contends that it is better in the future to concentrate on addressing the shortcomings and problems related to the present Internet's operation, rather than investing in, and building, a new Internet for the elites.

Therefore, an accessible Internet for everyone is an immediate priority, rather than a smart Internet that works for some but excludes the participation of others. Debates about 'technology futures' rarely canvass the complex issues related to those who have access to new technologies, and on whose terms this access is granted. After years of steady uptake within regions of affluence, global access to the Internet remains a privilege for only 880 million of the world's 6 billion people (Internet World Stats, 2005). Kofi Annan, United Nations Secretary-General has noted:

> The digital divide is real. It is actually several gaps in one: a technological divide in infrastructure, with 70% of the world's users living in the 24 richest countries, which contain just 16% of the world's people; a content divide, with nearly 70% of the world's web sites in English and a frequent lack of locally meaningful material; and a gender divide, with women and girls in many countries, rich and poor alike, enjoying less access to information technology than men and boys. (Annan, 2003)

An elitist network society shields its citizens from the reality that less than half the world's population has access to a telephone, according to figures from the International Telecommunications Union (ITU Basic Indicators, 2003).

Internet users continue to be bombarded by a range of malevolent online practices that have caused governments, businesses, and consumers to spend billions of dollars in attempts to forestall a rapidly deteriorating Internet. Viruses, worms, spyware and phishing have turned the Internet into a user minefield. Spam has reached epic proportions, and is now one of the greatest polluters of the Internet environment. According to a study conducted by the Stanford Institute for the Quantitative Study of Society in late 2004, about five minutes of every hour on the Internet (over 8 percent of the total time online) is spent dealing with spam (SIQSS, 2004). The constant noise generated by spam will continue to have an adverse effect

on productivity. This trend may lead to decreasing trust of online services within the wider community towards 2010.

Today, the majority of users are forced to confront the 'dark side' of the Internet head on with relatively little outside help from suppliers. Computer novices are especially defenceless against attacks from some nefarious operators keen to trap unsuspecting users into the latest credit card scam or virus download. Virus writers have become incredibly sophisticated: 'desktop hijacks' by criminal gangs has become a growing problem. Consumers are forced to maintain a vigilant stance by adopting security practices that run the gamut of anti-virus, anti-spyware and personal firewall software.

Many proponents of 'Not The Smart Internet' regard the myriad of problems confronting Internet users as partially stemming from the market dominance by a few key players. Microsoft's stranglehold on the home desktop space continues to deliver the company profits at the expense of user security. Critics argue that Microsoft's proprietary development model has led to inferior software applications that are cumbersome and leave users vulnerable to attack from adware, spam, and viruses. *Wall Street Journal* columnist Walter Mossberg has said that the Microsoft platform has so many security concerns that "if you use a Windows personal computer to access the Internet, your personal files, your privacy and your security are all in jeopardy" (Mossberg, 2004).

Open Source

A strong current of thought within this School promulgates an Open Source position for the future that brings to mind aspects of the Internet's hacker and virtual communitarian culture (Castells, 2001). With roots in American West Coast libertarian and counter-cultural discourses, these proponents view the Internet as an emergent, grass-roots phenomenon, and maintain that a distributed network requires an open model of cooperation in order to foster innovation, improve fault tolerance, and provide scalable solutions. This 'hacker ethic' has been popularly espoused by Free Software activist/technologist Richard Stallman, creator of the GNU project, and the Linux renegade Linus Torvalds, the namesake behind the hugely successful Linux operating system (DiBona ed., 1999).

Lawrence Lessig, Professor of Law at Stanford University, is the most outspoken advocate of the Open Source development model which is so critical to building a better Internet for 2010. Critics like Lessig claim the current US copyright regime enforces punitive legislation

that goes too far in controlling public access to cultural resources that belong within the public domain. For 'open commons' advocates like Lessig, extreme regulation and control are seen as anathema to the core values of all liberal democracies. In response to this, the Creative Commons licencing model was established as a means of providing a more equitable copyright regime. This model attempts to balance the needs of artists, musicians, and writers together with the rights of copyright holders, has gained widespread approval, and will be ported to a number of international jurisdictions.

Closer to home, Professor Brian Fitzgerald, Head of Law at Queensland University of Technology, led the team charged with the task of porting the Creative Commons licence to Australia. Completed in January 2005, this process adds Australia to a growing list of countries that have adopted alternatives to the dominant Intellectual Property system. David Rooney, from the University of Queensland, would like to see the development of a parallel creative economy that gives grass-roots producers an opportunity to share their work with a wider audience. 'Creative Commons' supporters believe the new licencing model provides creative producers with a distribution, communication, and community framework that fosters innovation, collaboration, and knowledge transfer. An even more open, diverse, and participatory range of content providers will see the Internet recapitulate the cooperative nature of its initial development. But 'Creative Commons' champions warn this could be jeopardised by harmonising legislation with the US government's strong Intellectual Property regime, as seen with the 2004 Australia-US Free Trade Agreement (AUSFTA).

By building a culture around the availability of free universal software, the Open Source community has revived the communitarian spirit of the Internet's founders. Starting with GNU-Linux, a global community of software developers has woven a collaborative Web that enables non-expert users to access a complete 'family' of free software applications. Government procurement of Open Source software has become widespread across Asia, South America, and Europe, in the wake of cost and security concerns. The highly anticipated Firefox Open Source Web browser is merely the next phase in an arsenal of applications like Open Office that continue to whittle away at Microsoft's market share towards 2010. This School of Thought champions secure, robust, and simple to use Open Source operating systems that enable customisable and personalised Web browsing, email, multimedia, and games.

Some 'Not The Smart Internet' commentators have framed the tussle over Intellectual Property rights as a 'culture war' between vested interests and the creative counter-culture.

Media scholar Siva Vaidhyanathan, in his book *The Anarchist in the Library* (2004a), characterises this battle for the commons as an age-old struggle between contending forces of anarchy and oligarchy. Vaidhyanathan argues that as our information systems become more complex, the dynamic between 'anarchists' (hackers trying to pry open the system) and 'oligarchs' (big business and governments that maintain information scarcity) will be driven to ever increasing extremes of attack and counter-attack. The popularity of peer-to-peer (p2p) file sharing has led the media/entertainment industry to adopt defensive manoeuvres to prevent the illegal copying, transmission, and storage of content bound by copyright.

The 'Not The Smart Internet' school takes the view that "information wants to be free" (a quote frequently attributed to Stewart Brand) and its proponents generally support the free sharing of digital content, irrespective of whether it breaches provisions of copyright legislation. Supporters of p2p filesharing, such as Siva Vaidhyanathan, Mark Pesce, Cory Doctorow, and others see such developments as products of an emergent, self-organising network culture, that ultimately leads to greater cultural freedom, media diversity, and personal empowerment. Doctorow, a lobbyist with the Electronic Frontier Foundation (EFF), cites historical precedents to reveal how corporations have responded to 'disruptive' technologies that undermine established monopolies or cartels (Doctorow, 2002). The Motion Picture Association of America's (MPAA) attempts to ban the VCR in the 1980s was one of the more infamous cases of corporate America using the legal system to try to prevent the release of a new technology. Despite this litigation failure, it appears the cycle of innovation-litigation-new paradigm is being repeated with the current generation of p2p music and movie filesharing applications, such as Kazaa and BitTorrent. P2P supporters argue that their community is too large, anonymous, and globally distributed, to ever be properly policed.

Viruses, spam, and adware can attempted to be dealt with using technological and legal mechanisms, yet often these remedies do little to allay users' fears about accessing the Internet. A CRC study, *Taking Users up the Value Chain* (2003), demonstrated that lack of trust in the Internet as a secure communications platform is a serious problem that can quickly escalate into a major inhibitor to ongoing Internet use.

Social Networking

Many advocates of 'Not The Smart Internet' put social and behavioural factors ahead of technological considerations. Danah Boyd is a researcher interested in the social issues that arise when people publicly articulate their relationships through Social Networking Systems

like Friendster. Boyd emphasises the importance of the "architecture in which we interact", in reflecting on good technology design (Boyd, 2004). As she explained: "It allows us to think about how what we build structures the underlying elements to the ways people can interact" (Boyd, 2004). She argues that "configuring the user" doesn't work and talks about the need to fit technology into social practices. Boyd calls for a reframed approach to Internet service and application design that puts users needs first (Boyd, 2004).

Another approach sympathetic to this position can be found in Bonnie Nardi and Vicki O'Day's *Information Ecologies* (1999) that uses the language of ecology as a metaphor to describe the way information systems interact with the social environment. Nardi and O'Day's ethnographic studies reveal how technical systems are "structurally coupled" to people, practices, and values in any given local environment. Information ecology perspectives view the technical and social realms as interdependent aspects of a whole system that interact with each other in profound ways.

Many other viewpoints within this School of Thought are highly critical of technological design that fails to adequately address its users' needs. The complexity of most software has led to a situation where many users access only a fraction of their system's functions, due to a widespread lack of perceived need and advanced skills training. Nearly fifteen years after the invention of the World Wide Web, email and Web browsing remain the most important reasons why people go online according to the USC Annenberg School's Digital Future Report (USC, 2004). The ambitious notion of a seamless network society so often postulated for the future, where users will be able to connect to any media, anywhere, anytime, is judged by 'Not The Smart Internet' as fanciful in light of the weight of past, and present evidence to the contrary.

The blinding speed of technological change, and general lack of technological literacy in the wider community, has led one journalist to describe Gen X and Gen Y the 'Tech-Support Generation'. He wrote, "Our job is to troubleshoot the complex but imperfect technology that befuddle mom and dad, veterans of the rotary phone, the record player and the black-and-white cabinet television set" (Stone, 2004). A comprehensive IT survey in *The Economist* (Kluth, 2004) takes this up by exploring the issue of technological complexity both for business and consumers. Its findings suggested that many find the technology too difficult to use and unhelpful when it came to alleviating the common problem of 'information overload'. The survey suggests 'the mum test' should become a geek's benchmark for true

simplicity. This should be a wake-up call to technologists, interface designers, and software suppliers. As one observer noted: "With email, it wasn't until my mum could use it that it became ubiquitous. The real test is always the mum test" (Kluth, 2004).

Many advocates of 'Not The Smart Internet' are at the forefront of equity and access debates, and encourage the formation of social enterprise initiatives that use technology to overcome socio-economic exclusion. Socially innovative 'Digital Divide' programs, initially devised to meet development goals, have the opportunity to reach the 70 percent of the population who are "terrified by technology" (Kluth, 2004).

Projects that utilise technology for social justice have the potential to transform users' life conditions in positive ways. The Simputer is one example: a device created to meet the needs of illiterate farmers in the developing world, provides a template for culturally sensitive technology design (http://www.simputer.org/). Its touch-screen interface and hieroglyphic language system requires little training to operate and enables users to participate in a range of online services.

While the cost of IT components continues to fall, affordability remains a serious barrier to entry for many lower income families. InfoXchange, a Melbourne-based ISP, bridges the 'Digital Divide' by making refurbished PCs available at a reduced cost through their Green PC program (http://www.greenpc.com.au/). This, and other projects, are driven by a belief that technology is not a means in and of itself but merely one strategy within a broader framework of community capacity building.

'Not The Smart Internet' proponents also believe that Internet access should be seen as an essential service of equivalent importance to access to the telephone, gas, or electricity. Australian scholars such as Gerard Goggin argue that the Internet enables citizens to participate more fully in society through access to a range of government, community and banking services (Goggin, ed., 2004). Many thinkers of 'Not The Smart Internet' are frustrated by the fact that despite the availability of broadband services in most developed countries, take-up levels in Australia have been disappointingly lower than expected relative to other countries. While the Australian broadband market has shown slow but steady growth, by the end of 2004 there were only 1.3 million broadband connections (ACCC, 2004). The economic and social advantages of 'always on' high-speed Internet access remain out of reach for most households due to prohibitive pricing structures.

Proponents of 'Not The Smart Internet' view most technologically advanced devices to access the Internet as little more than expensive systems that lock users in to 'walled gardens' of proprietary standards and preferred partner agreements. They advocate open standards for audiovisual content and devices for the future, and are critical of products that tether users to narrow service offerings. Siva Vaidhyanathan champions this position, and is dismissive of devices that restrict users' ability to consume media in the format of their choosing:

> As anyone who has considered the growing array of portable digital music players and services knows, the Balkanization of formats is a major impediment to the long-term success of such services. Every service is trying to be the last one standing so it can dictate form and formats, and corner the market on secondary goods (Vaidhyanathan, 2004b).

Interoperability and open standards like XML and RSS Feeds are also heralded for enabling the widest cross-section of society to access the Internet regardless of the device being used. The role of the Internet in civil society is another theme explored by champions of the 'Not The Smart Internet' school. The popularity of Blogs (web diaries) and Wikis (open-edit web pages) is seen as a testament to the power of community organising. These two developments in particular are very primitive technologically, but have had an enormous impact through the social networks that have sprung up around their use. Blogging continues to have widespread effects in the fields of journalism and politics as thousands of 'bloggers' exchange ideas, post their daily thoughts and commentaries, and thereby act as filters to the hoards of web surfers suffering from 'information overload'.

Wikipedia (www.wikipedia.org), a collaborative encyclopaedia project, is a notable application that emerged out of nowhere to become the world's largest and most successful online reference site. Any user can contribute content, make changes, and revise articles based on a peer-reviewed system of editorial control. Such developments tend to confirm David Weinberger thesis in *Small Pieces Loosely Joined* (2002) that the Internet's imperfections are more than compensated for by the webs of human relationships that keep it functioning.

Social Network evangelists like Howard Rheingold see these developments as pointing to the emergence of a new 'culture of cooperation' (IFTF, 2004). Douglas Rushkoff, Professor of media culture at NYU also views the interactive tools facilitating changes for the future in the political and civil society realms as signs of new 'interactive renaissance culture' (Rushkoff, 2003). Such optimism stems from excitement over grass-roots movements like Meetup.com that provide social tools for 'communities of practice' to facilitate face-to-face meetings across

cities the world over. Other examples include the liberal political movement that has sprung up around the website MoveOn.org. Site organisers have raised millions of dollars to support the campaigns of preferred candidates and pay for a series of advertisements which attack their political adversaries in the mainstream media. Advocates for 'Not The Smart Internet' would welcome initiatives for independent news and media sites like Indymedia.org and CommonDreams.org. These websites are generally staffed by volunteers and run on Open Source platforms that enable any user to post items to them.

So the Internet that the world needs by 2010 is not necessarily a communications platform that is driven by major financial and technological investments for more and more product applications, but one that builds more manifestations of productive social capital.

'Not The Smart Internet' Champions

Lawrence Lessig, Brian Fitzgerald, David Rooney, Siva Vaidhyanathan, Howard Rheingold, Mark Pesce, Cory Doctorow, Richard Stallman, Douglas Rushkoff, Danah Boyd.

School of Thought 3: Rich Media

This School of Thought is primarily driven by technological innovation in a world where there are a plethora of devices, applications and services feeding off the Internet by 2010. Its members are not inherently technologically deterministic in their approach to 2010, but are increasingly aware that 'smart' also means that technology innovation has to be developed within a context of relevance and usefulness to a diversity of markets, people, contexts, and places.

Increasingly personal communications have shifted away from a paradigm of a single person using a single device, to a multi person/multi device scene where people use an array of devices - i.e., a desktop pc, a laptop pc, a personal digital assistant, a mobile phone, and an MP3 player. And in a rich media environment, more and more people are able, and also can afford, to access the Internet, via a workstation, mobile phone, a PDA, or some other appliance. Therefore, as we approach 2010, more and more people will access a wide array of Internet based services irrespective of their dependence on a particular technology or a certain mode of connectivity.

These new forms of fusion will see more manifestations of convergence emerge towards the year 2010. The past thirty years have witnessed an increasing merging of the traditional industries of media, telecommunications, and broadcasting – institutionally and functionally. We have seen the related marriage of analogue and digital technologies, and of fixed line and mobile technologies. We are now heading towards more diversified forms of convergence where voice, data, video, fax, graphics images, animation and streaming media will come together in a new multimedia world. Eventually perhaps, a multimedia Internet will emerge that provides widespread access for most people to access on this globe – though that highly desirable prospect is extremely unlikely to occur by the year by 2010.

Proponents of the Rich Media School believe network convergence will accelerate in the coming years in a way that will enhance the richness of services available in smart homes. Quigley (2004:15) has pointed out that currently the typical Internet connected Australian home has two separate networks. First there are entertainment devices such as radio, television, VCR, DVD, with services delivered via cable, satellite or analogue modes. The second consists of computers and other computing devices communicate using digital transmission over phone lines or cable lines.

Quigley has predicted that "the integration and possible merging of these two disparate networks will accelerate the development of novel applications in the areas of digital television, interactive entertainment, high definition television, on demand content and personal media recorders." (Quigley, 2004) So the tools are emerging to deliver 'smart' multimedia content, with managed access rights, where several digital items such as music, video, images and text are packaged together. These content forms will be available not necessarily through a computer as we know it today but will become widely available to offices and homes. Moving towards 2010, a new dimension will be the increased number of 'always on' smart sensors and actuators that are used for security, environmental control, or entertainment throughout the smart home. This networking will operate in the future through the wired home network, the phone line network, power line network, and more recently with radio frequency networking or some hybrid approach.

Mark Pesce, lecturer of interactive media at the Australian Film Television and Radio School (AFTRS), contends we are entering the 'era of hyperdistribution' that will radically change the rich media landscape. Central to this shift is the take-up of filesharing software like BitTorrent that provides the first truly efficient digital media distribution platform based on the principles of swarming. Open Source Television (OSTV) is an early indicator of the 'hyperdistribution' era. OSTV enables users to bypass programming schedules, international time zones, over-regulation and oligopolies, Pesce told a Smart Internet Technology CRC conference in July 2004 (Pesce, 2004a). Independent media producers are using OSTV to reintermediate the digital media value chain and go directly to consumers (Pesce, 2004b). This has the potential to transform broadcast television and give users access to a virtually unlimited amount of digitally produced content, accessed via the Internet.

The Rich Media School of Thought is closely related to a growing body of advocates of the pervasive computing approach for the future. The Cambridge-MIT Institute (CMI), a strategic alliance between the University of Cambridge in the UK and the Massachusetts Institute of Technology in the US, has established a 'Pervasive Computing Community'. The group started with what they call a 'fairly simple constatation':

Over the last two decades…the shared computer was replaced by the personal computer, which in turn has shrunk in size from desktop, to laptop, to palm-held devices, including PDAs, mobile phones to pagers. The trend is likely to accelerate so rapidly, enhanced by wireless technology, that by the end of this decade we can expect individuals to be using hundreds of computing devices every day for work, education and play - some of them mobile, many of them embedded in the environment around us. There are still significant challenges to face before all these devices can improve our quality of life, such as designing better interfaces with these ever smaller computers.

(Roland Piquepaille's, *Technology Trends*, 12 April 2004)

The CMI 'Pervasive Computing' Community sees the following issues as key future challenges:

- Security: we need to find ways to make the user interfaces more robust against unauthorised use and intrusion.

- The latest generation of peer-to-peer systems: researching ways of creating robust networks that can spread information anonymously and are available 24x7.

- Immersive systems: designing systems that will be programmed by expressing a mere *intent* of the required service, while automatically generating an implementation to satisfy and maintain the user goal. For instance, we will be able to request a conversation with a friend or colleague - via the desktop PC in our office, say - and then have the system automatically establish and reconfigure the connection and keep it going so that we can keep talking (via mobile phone, handheld device, or whatever computer is available) as we leave the office and move around.

- Power-efficient computer architectures: If we are genuinely going to be able to do our computing on the move, we need to address the shortage of battery power on wireless computing devices, and find new processor architectures designed to conserve power.

- The development of computer vision and speech processing technology so that instead of having to communicate with our computers using the tools *it* understands - Windows software, icons, a mouse - we can do so using better language technology than exists today, and computer vision technology that will let us communicate with gestures and body language.

Simon Moore, a leading member at Cambridge University's Computing Laboratory, argues that:

> We can take a 1960s supercomputer, shrink it to the size of a sugar cube and sell it for under £10, but how do we use it to make your life better? It needs to be sentient, loyal, small and low maintenance. This raises technical challenges in the areas of low power electronics, security, distributed computing and human/computer interaction. (Simpson, 2004)

Victor Zue, also from MIT's Computer Science and Artificial Intelligence Lab, predicts:

> Within the next decade, many of us will be fully immersed in a nomadic lifestyle, in which we will demand instant access to data and information for education, work, and play, no matter where we are. This KIC, consisting of some of the best minds across the Atlantic ocean on computer networks, power-aware computing, security and privacy, natural interfaces using speech and vision, and software architecture, will work cooperatively to meet some of the challenges posed by this change in lifestyle. (Simpson, 2004)

Comparable pioneering work conducted by the European Commission (Ducatel et al., 2001) discusses critical social-critical factors in the context of what it describes as a set of **'Technology Requirements'** in its *Scenarios for Ambient Intelligence in 2010*:

a. **Requirement 1 – Very unobtrusive hardware** – e.g., where active devices such as sensors and actuators are integrated with interface systems in order to respond to the users' sense, posture, and environment.

b. **Requirement 2 – A seamless mobile/fixed web based communications infrastructure** – an environment where there is complete integration of mobile, fixed, radio and wired networks, and also where core and access broadband networks are likely to converge.

c. **Requirement 3 – Dynamic and massively distributed device networks –** this is a world where there are almost uncountable devices and networks which are required to be configurable on an ad-hoc basis according to short lived talks with variable actors and components.

d. **Requirement 4 – A natural feeling human interface –** here the central challenge is seen to be to create systems that are intuitive in use –almost like normal human functions such as breathing, talking, and walking.

e. **Requirement 5 – Dependability and security** – here technologies must be created that are safe, dependable, and secure of users. These are the set of emerging 'trust technologies'.

One of the most talented Internet futurists with his great ability to bring together disparate strands of thinking, is Leonard Kleinrock, a man with a distinguished place in the history of the Internet. It was Kleinrock who wrote the first sentence of a press release on July 3, 1969 announcing that the forthcoming birth of the Internet would take place two months later – on September 2, 1969.

Leonard Kleinrock, now Professor of Computing at the University of California, sees three major emerging dimensions for the future of the Internet (Kleinrock, 2003):

a. *nomadicity* – where a rich set of computing and communication capabilities and services is offered to 'nomads' who move from place to place in a way that is 'transparent, integrated, convenient and adaptive'. For Kleinrock, the goal of nomadic computing is precisely to permit users and programs 'to be as efficient as possible and as unaffected as possible in the environment of uncertain connectivity and unfamiliar locations.' He stresses the importance of independence, referring to the perception of a computing environment that *automatically adjusts* to the processing, communications, and access available at the moment and at that location, all customised the that users profile, preferences and privileges.

b. *embeddedness* – where small intelligent devices embedded in the physical world are connected to the Internet. For Kleinrock, 'this embedded technology will comprise sensors, actuators, logic, memory, processors, communicators, cameras, microphones, speakers, displays, RFID tags, etc. When I walk into this room enabled with this technology (the intelligent room) the room will know I have just entered. I will be able to converse with the room in natural language asking for information on a given subject, and perhaps four books will reply with their table of contents. The web will present me with links and information via natural language speech, video, images, eyeglasses, displays, holograms, or other human centered interface technologies.' (Kleinrock, 2003)

c. *ubiquity* – where Internet services are available wherever the 'nomad' travels on a global basis. This is a longer term goal which implies widespread access deployment of network access which has a long way to go for the Internet before we achieve global 'any to any' connectivity. As the technologies of copper based DSL, of copper based cable modem, and satellite access appeared there was the

prospect that broadband services would become widely available, but Kleinrock's masterly understatement is that 'a number of impediments have prevented the timely rollout of these services'. He sees WiFi as a disruptive technology and argues that 'we have let loose a 'monster' and it is now our challenge to tame it into a stable and functional technology … that is rapidly deploying and gaining widespread use.'

For Leonard Kleinrock the vision of the Internet has five key elements:

a. The Internet technology will be everywhere

b. It will always be accessible

c. It will always be on

d. Anyone will be able to plug in from any location with any devices at any time

e. It will be invisible

This School of Thought frequently uses the term 'smart' as integral to their terminology. In the context of this report some of the new smart technologies, such as smart self adjusting washing machines, smart alarm clocks, and savvy fridges that may become Internet enabled in the future, have not been included. The Smart Internet-based systems and services analysed here are those that are, or may be in the future, adaptive, portable, and about problem solving. The new software will learn about the users and help them navigate the web in order to individualise content to suit their preferences. Various input and output modalities will be linked to the conversational agent in a natural and transparent way that will be 'smart' enough to know which modality is the most appropriate for users in different situations.

Wayne Wobcke's 'Intelligent Agents Technology Review' (2004) for the Smart Internet Technology CRC canvasses a number of applications for software agents. The vision of a 'personal assistant' is already being realised through applications that aid information processing (such as personalized web search and information aggregation), communication processing (email, document management and call handling) and time management (meeting scheduling applications). As Wobcke articulates: "More complex personal assistants aim to address more than one of these aspects within a single system." (Wobcke, 2004)

The ultimate culmination of the notion of 'smart' is a system with the capability to reason and think about itself and its environment – but most of all about its users –it will become a

personal assistant. Eventually the future Internet may offer any technology, any application, any service, anywhere, any time – for any global user.

But for that we will have to wait beyond 2010.

'Rich Media' Champions
Bill Gates, Leonard Kleinrock, Simon Moore, Aaron Quigley, Victor Zue, Steve Jobs, Rob Glaser, Mark Pesce, Cambridge-MIT Institute, IST Advisory Group (ISTAG) of the European Commission.

School of Thought 4: Chaos Rules

This School of Thought is primarily concerned with a future Internet that is in a continual state of decay and worsening disorder. Exponents share a sceptical pessimism about the robustness of Internet services that may be ruined by 'spam' junk emails, rogue hackers and viruses. They distrust the utopian visions of high-tech society because an over-reliance on information technology also creates pathologies and vulnerabilities. Chaos Rules advocates believe Internet futures will be dominated by a negative utopian vision they describe as Digital Dystopia. The root cause of this vision is the Internet's chaotic and decentralised nature as a communications infrastructure.

Everyone has experienced a foretaste of Chaos Rules from the frustration of an email inbox filled with spam to the grief of losing important data when a computer freezes up. Before the 2000 dotcom crash prompted a reassessment of their strategies, managerial writers regularly touted the 'disruptive' power of Chaos to create new opportunities for companies, industries and nation-states. Dystopian imagery is pivotal to the Cyberpunk books, films, comics and electronic music that depict Internet futures with dark foreboding.

Dystopian popular culture now influences the policymaking debates on the Internet's social impacts and governance policies. People are aware of the dangers but unsure of how to proceed; institutions are paralysed. Chaos Rules builds on earlier insights regarding 'cosmic hopelessness' (Polak, 1961) and 'future shock' (Toffler, 1970) in science and technology studies. Analysts need a broader, deeper and more nuanced understanding of Chaos Rules and how it can be used to develop the 2010 Internet.

The Coming Internet Collapse: Reality or Sound-bite?

Helsinki University of Technology professor Hannu H. Kari illustrates the challenges that Chaos Rules presents to strategic analysts. Kari warned that the Internet would collapse in 2006 because its network infrastructure was never designed to be a mass communications platform. Complexity scientist Albert-László Barabási also traces this infrastructure problem to the "tangled tale of converging ideas and competing motivations [that] left their mark on the Internet's structure, creating a jumbled information mass for historians and computer scientists to unravel." (Barabási, 2002: 145-146).

Global newswire services transformed Kari's analysis into a pithy sound-bite on viruses, spam, identity theft, and trans-national crime networks:

> "There are many bad people who want to create chaos on purpose," said Kari, who has in the past voiced doubts about the Internet's future. . . . Kari said spam and viruses are the main culprits. The next stage is that the loosely organised global network will function less and less smoothly, and become progressively more prone to manipulation. (Sapa-DPA, 2004)

Kari's analysis had media appeal for several reasons. Douglas Kellner, professor at University of California (Los Angeles), believes Y2K and subsequent dystopian warnings embody a politics of cultural fear. (Kellner, 1999). Susan Moeller, associate professor of journalism at the University of Maryland, observes that editors rely on sound-bite "media narratives" to simplify complex issues for audiences who "want the 'who-what-where-when,' but not the 'how' and 'why'." (Moeller, 1999: 25). Finally, the history of 'technology futures' shows the influence of German philosopher Oswald Spengler, a cultural pessimist who warned of decline and collapse in the face of social complexities. (Galtung and Inayatullah, 1997: 104).

Kari responded to this media coverage by further clarifying his arguments and exploring the possibilities for protecting the Internet's infrastructure. His solution for communications protocols and user authentication has integrated aspects of the Adaptive User Environment and Not The Smart Internet schools of thought (Kari, 2004).

Kari's analysis received independent confirmation at the AusCert conference in May 2005. Kc Claffy, founder of the Cooperative Association for Internet Data Analysis, warned that "business dependency" on the Internet would exacerbate its problems over the next 10 years. (Crawford, 2005: 4). Claffy links Kari's concerns to the growing interest in business resilience, disaster recovery, intelligence analysis, and global security firms. But as cryptographer Bruce Schneier observes, these solutions cannot rely on technology alone, because "security is a weakest link problem" that must involver experiential design, human factors, and users (Schneier, 2003).

Defining Chaos

'Chaos' is defined in a variety of ways. This section considers three worldviews that define how chaos is perceived. As summarised by US Defense Secretary Donald Rumsfeld, 'chaos' may be perceived as an 'irregular' decline from a 'positivist' higher order; as a 'disruptive' pattern of chaotic and turbulent change; and as 'catastrophic' anarchy that can escalate

(Rumsfeld, 2005: 3). These three worldviews will then be applied to specific contexts to summarise how Chaos Rules exponents view Internet futures.

The first worldview emerged from the 18th century capitalist order. Chaos was perceived as an 'irregular' decline from the inevitable linear progress to a higher order. Many believed that positivist science, industrial democracy, and wealth creation would overcome the earlier constraints of agrarian and feudal ages. The theories of economist Adam Smith, philosophers Auguste Comte and Herbert Spencer, and sociologist Max Weber laid the foundations for contemporary globalisation. Comte's exaltation of science influenced early visions of the Information Technology society; Spencer's 'social Darwinism' infiltrated Internet e-commerce; dotcom-era CEOs looked to Weber's charismatic leader for inspiration; and magazines like *Wired*, *Red Herring* and *Fast Company* updated Smith's *Wealth of Nations* (1776) for a modern audience. Collectively, they represent the 'default' position of many companies, leaders, and policymakers.

The second worldview emerged from the systems sciences of biology, mathematics and physics in the late 20th century. Chaos is a pattern of non-linear disequilibria that creates unanticipated outcomes and may trigger systemic shifts. Ludwig von Bertalanffy's metaphor of the 'butterfly effect'—a butterfly flaps its wings over Texas and cause a hurricane elsewhere—translates chaos theory into the popular consciousness. Management writers including James Gleick, Peter Senge, and Margaret Wheatley have used systems terms like 'bifurcations' and 'strange attractors' to describe organisational dynamics. The Santa Fe Institute in New Mexico has applied these insights for Citibank's models of global financial flows (Gleick, 1987).

The third worldview emerges from experiences viewed as truly 'catastrophic' environments and geopolitical regions where governance has broken down. Chaos is the emergence of nebulous anarchy, of non-traditional risks, and threats to companies and nation-states that, even if predicted in advance, quickly escalate or mutate into terrifying unmanageable forms (Beck, 1999; Chua, 2003). This position informs international relations, risk management and security studies. It may be a geopolitical region that is experiencing a civil war, conflict zone, 'failed state' or a humanitarian disaster (Everard, 2000; Chua, 2003); a post-millennial 'information ghetto' or 'dark.net', such as security-protected sites used by trans-national cartels and organised crime syndicates not detected by search engines; or these risks may underpin 'normal accidents' such as the Chernobyl reactor meltdown and the Columbia

space shuttle explosion, caused by human error, and, disturbingly, by the unforeseeable interactions of complex socio-technical systems (Perrow, 1984; Dumas, 1999). Specific analytical methods have been developed by Foresight analysts to anticipate some of these risks, notably 'wild cards' or predictors of low-probability high-impact events (Petersen, 1999).

Chaos Rules: The 'Eye of the Beholder'?

'Chaos' is a contested concept. Microsoft's Bill Gates contends the Open Source (OS) software movement is 'chaotic' and threatens the free market. OS advocates Richard Stallman and Cory Doctorow counter-argue that Microsoft's oligopoly and software design processes are the underlying problems.

Perhaps it is a matter of perception. To win the 'hearts and minds' of their audience, Kari, Gates or the OS advocates must appeal to aspirations, goals, and values. Alternatively, they may rely on emotional manipulation and symbols rather than overt ideologies. Jacques Ellul, a critic who has influenced many Chaos Rules members, contends the high technology society exists in the borderline between market rhetoric and 'sociological propaganda'. For Ellul, these messages are framed 'no longer to modify ideas, but to provoke action' (Ellul, 1973: 25). The power to label another party as 'chaotic' is one way of framing and control the public debates. To evaluate these claims context and critical distance are required.

The 'eye of the beholder' is an alternate interpretation that, in its most extreme forms, collapses into postmodern relativism. Chaos Rules becomes a frame to examine Internet futures yet one that is also a cognitive style, a learned behaviour, rather than a technological preference. Organizational culture embeds this frame within institutions. All Schools of Thought influence decision-makers and managers yet Chaos Rules is especially insidious if it becomes an unquestioned norm. It can skew perceptions and distort judgments; it also confers benefits. Analysts fluent in the Chaos Rules environment can identify weak signals that others miss. In its healthy form Chaos Rules is useful as Machiavellian-style 'anxious foresight' that identifies over-the-horizon problems and takes pre-emptive action (Kaplan, 2002: 66).

The Greek heroine Cassandra is often cited as a cultural archetype for the unhealthy form. Cassandra could prophesy the future, and she predicted Troy's fall, yet she was unable to persuade others to take precautionary actions. Cassandra's fate suggests why dissenting

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analysts who identify blind-spots, groupthink and other perceptual biases need managerial protection to be truly effective.

Internet Infrastructure

The Internet's evolution has imposed constraints and limits on its communications infrastructure that are only now being appreciated. Network architects have used insights from ecology and political geography to map the Internet's growth and the clusters of Internet communities and 'information tectonics' (Wilson & Corey, 2000). This viewpoint counterbalances the usual 'speed' descriptions with a more longitudinal analysis. 'Thinking networks' can pre-empt common infrastructure problems (Barabási, 2002: 211). The Smart Networks program of the Smart Internet CRC has also investigated these problems.

In the mid 1970s the Internet's predecessor ARPANET faced constraints as the network expanded beyond research institutions and universities to the general community. ARPANET originally 'was intended for resource-sharing' and 'not intended as a message system' (Hafner & Lyon, 1996: 189), later split into military and public networks, and the US-based National Science Foundation subsequently allowed the public network to be commercialised. The original constraints of rapid network growth faded from view as the Internet 'crossed the chasm' from visionaries to the technology mainstream. Proponents of the 'irregular' definition believed that Internet e-commerce and site subscription revenues would eventually overcome any short-term financial problems. The April 2000 dotcom crash was a major shock for them.

Rich insights emerged from 'disruptive' proponents, who understood the complexities of large networks and the historical forces that had shaped the Internet's design. Chaos and systems theorists realised that Internet uptake was a 'critical threshold' for waves of users, and that technological innovations had dramatically altered the underlying infrastructure. For Henry Ergas:

> That decentralisation has been a source of the Internet's enormous strength is undoubtedly the case. But it has also created severe weaknesses. The most obvious is that as so much network control resides at the user terminal, or close to it, there is enormous scope for users to act destructively. In some cases, such as viruses, purely malicious conduct is involved. In others, such as spam, commercial motives are at work. The Internet's lack of hierarchy makes preventing this kind of behaviour nearly impossible. (Ergas, 2003)

The Internet's spatial topography was the key, and users could influence this spatiality through the power to create and update links. Albert-László Barabási observes:

> While entirely of human design, the Internet now lives a life of its own. It has all the characteristics of a complex evolving system, making it more similar to a cell than to a computer chip. Many diverse components, developed separately, contribute to the functioning of a system that is far more than the sum of its parts. Therefore, Internet researchers are increasingly morphing from designers into explorers. (Barabási, 2002, 149-150)

Proponents of Chaos Rules view this uncontrollable ecosystem with considerable concern. Barabási notes that 'scale-free' networks such as the Internet make it virtually impossible to eradicate Love Bug, Nimbda and other viruses (Barabási, 2002, 135). Spam, Internet porn and identity theft have become endemic. For 'irregular' proponents this has become a reason either to create virus detection solutions or stay with traditional media outlets, and not venture beyond major sites and trusted Web portals. On the other hand, 'disruptive' exponents believe these problems can be managed, if the major culprits—malicious users, poorly designed software, and renegade service providers—are identified and targeted. Experts on non-traditional threats, like Richard Clarke warn that critical infrastructure may face a 'catastrophic' cyber-terrorist attack.

Barabási hints that the Internet's balkanisation into regularly visited Web portals and 'ghost sites' that become marooned in cyberspace as the Internet's topography changes. The philosopher Zygmunt Bauman suggests this balkanisation is part of 'liquid' modernity: the Internet's fringes will become a 'vast theatre of boundary wars' where hackers and law enforcement agents will be locked in 'endless 'reconnaissance skirmishes'' (Bauman, 2001: 141). Cyberpunk author Bruce Sterling evokes this Digital Dystopia in *Islands of the Net*, a post-millennial world of data pirates, mercenaries and enigmatic voodoo cults (Sterling, 1988). Chaos Rules exponents may view this scenario in three different ways: for 'irregular' believers, as a temporary problem that the Internet's future evolution will solve; for 'disruptive' analysts, as a complex problem that requires adaptability and systemic interventions; and for 'catastrophic' strategists as a place from which non-traditional threats arise (Urry, 2003: 11).

But communitarian advocates of Not The Smart Internet have another view: they believe that people who run 'ghost sites' are often isolated and exist in a cultural limbo. They may be persons who have no right as a group and little access to social resources. They are on the wrong side of the 'digital divide', and it is not unsurprising that they attract negative labels from those with vested interests in profiteering rather than equitable Internet access for all.

Disintermediation and Innovation

The Internet's surge in the mid-1990s as a commerce platform also changed the managerial paradigm for understanding chaos. A new vanguard of Internet pioneers rejected the waves of downsizing and acquisitions mania that swept the United States. Promising to liberate both intellectual capital and workers, and overthrow the traditional business order. Netscape's Marc Andreessen, Amazon.com's Jeff Bezos, and Razorfish's Jeff Dachis were part of this group who became celebrated business icons.

These pioneers looked to Chaos as a force that could be harnessed by business firms to create new industries, customer niches, and revenue streams. Many were influenced by Harvard economist Joseph Schumpeter who theorised about 'creative destruction' in *Business Cycles* (1939). Schumpeter contended it was necessary to radically alter industries, as a countercyclical move, in order to prevent future economic depressions. Intel's Andy Grove reinvented Schumpeter for the 1990s when he advised managers to cultivate a 'paranoid' ethic. Companies who wished to survive needed to anticipate the 'strategic inflection points' that enabled firms to dominate industries and markets (Grove, 1999).

Philip Evans and Thomas S. Wurster, senior managers in the Boston Consulting Group (BCG), applied Schumpeter's model to dotcom-era companies in *Blown to Bits* (1999). After surveying the automotive, financial services and manufacturing industries, Evans and Wurster singled out Charles Schwab, Dell, Amazon and Yahoo! as exemplars of this new business environment. Schumpeter's influence is also evident in Clayton M. Christensen's *Innovator's Dilemma* (1997), which showed how smaller firms could outmanoeuvre larger incumbents by creating 'disruptive' technologies, and Gary Hamel and C.K. Prahalad's *Competing for the Future* (1996), which advised companies to develop internal core competencies, use stretch goals, and create 'industries of the future'.

The dotcom pioneers therefore moved beyond the linear, positivist model of 'chaos' as decline, and were beginning to grasp the power of chaos theory. Amazon.com's Jeff Bezos exemplified this interest when the e-commerce site built a loyal social community around product reviews, based on Massachusetts Institute of Technology professor Pattie Maes' software agents. Bezos had tapped into 'power laws' to create exponentially increasing returns and outflank its major competitor Barnes & Noble (Koch, 2001). Other dotcom-era firms were not as strategic. The dotcom consultancy firm Razorfish developed new business models, and, in a high-profile media campaign, threatened to 'disrupt' traditional consulting

firms. But despite utilising the power of the chaos and systems sciences, Razorfish was thwarted when BCG, McKinsey, and other competitors studied its techniques and incorporated the innovations into their digital service offerings. Eventually, many dotcom pioneers who set out to disrupt traditional conventions found themselves destroyed along the way. A more subtle understanding of Chaos could not always win against brute force and the sheer weight of incumbent consultancy firms.

Business analysts and academics frequently refer to disintermediation as a major explanation for the pioneers' early success and their rapid fall. Adrian Slywotzky, Mercer Management Consulting's managing director, defines disintermediation as "the compression . . . of traditional distribution channels in favour of more efficient, closer, or even direct relationships between customers and suppliers" (Slywotzky & Moser, 1998: 163). Disintermediation was the core pattern for Evans, Wurster and other analysts, and consequently has become synonymous with dotcom-era restructuring. Yet as Slywotzky and his colleagues note, disintermediation is just one of over 20 'profit patterns' that restructure the dynamics of competitive firms and industries. Evans, Wurster and others helped create a self-fulfilling prophesy by describing disintermediation in stark terms and by not recognising other choices. Chaos Rules becomes inevitable when analysts fail to anticipate change, build core competencies within companies, and execute their strategic vision effectively.

Disintermediation can also be used to re-evaluate past debates like the effects of peer-to-peer filesharing on users. When programmer Shawn Fanning released Napster in 1999 he created the music industry's worst nightmare: software that enabled fans to share MP3-encoded music files, bypass record labels, and create a global jukebox. The Recording Industry Association of America (RIAA) and major recording companies filed an intellectual property suit against Napster. In response, and as the legal battles unfolded, fans discovered that musicians had aligned themselves with one of the camps. Public Enemy rapper Chuck D spearheaded the Not The Smart Internet camp, and passionately argued that Napster supported independent artists and freed musicians on major labels from unfair recording contracts, while Metallica drummer Lars Ulrich was Chuck D's opponent, argued that Napster fans were stealing millions from artists, music labels, and would bring an end the music industry as we know it. Universal sued Napster in 2001, and the peer-to-peer filesharing network was acquired by Roxio in mid 2002, and then relaunched as an industry-friendly subscription service.

Ironically the Chaos Rules debate focused on fears of 'disruptive' change rather than acknowledging the 'disruptive' practices that were already industry norms. Producer Steve Albini noted almost a decade before the Napster battle, in an article for the satirical *Baffler* magazine, that the average independent band would make the recording industry $3 million over the life of its deal yet be US$14,000 in debt (Albini, 1993). After the Napster lawsuit the *Harvard Business Review* touted 'Napsterization' as that year's killer business strategy, highlighting how corporate strategists were embracing peer-to-peer innovations.

'Chaos Rules' Champions
John Arquilla, Damien Broderick, Mark Dery, William Gibson, Andrew S. Grove, Bill Joy, Hannu H. Kari, David Ronfeldt, Clifford Stoll, Siva Vaidhyanathan.

II. People

5. Understanding Users Towards 2010
Trevor Barr

The invisible computer is the end result, hiding the computer, hiding the technology so that it disappears from sight, disappears from consciousness, letting us concentrate upon our activities, upon learning, doing our jobs, and enjoying ourselves. The goal is to move from the current situation of complexity and frustration to one where technology serves human needs invisibly, unobtrusively: the human centred, customer centred way.

Donald Norman—The Invisible Computer (1999)[3]

Technologies are often constructed first and foremost for an elite group of users and only afterwards diffuse into and become adopted by a broader community. While a technology, such as the plain old telephone service (POTS) may now be adopted by the vast majority of Australian households, it is quite possibly an "alien" artefact for others, including for remote Indigenous communities. The challenge, then, is to determine whether *alternative technologies* may be possible, and to determine what *adaptation* may be needed in the existing technology, and/or in the supplier's processes and procedures, and/or in the user group, to achieve better (communications) outcomes.

Robert Morsillo—Group Manager, Consumer Affairs, Telstra (2003)[4]

User Contexts

A primary question underpinning this report is what might the Internet be like from the users' perspectives by 2010? The accuracy of past prediction and prophesy regarding the possible level of acceptance of new communications technologies by end users shows a decidedly patchy history. Much work about users in the future is still closely tied to notions of technological determinism – "we have these network services for you to use" - or prospective developments are tied to technological utopianism – "these digital services will change your work, home and life". Yet many of the best recent innovations for users have emerged as wild cards.

During the past decade we have witnessed the surprisingly widespread acceptance of relatively new services, notably email, text messaging, and Google's PageRank™ search tools - which none of the major players planned for, or forecast. Part of the reason for this is that we know little about why consumers and citizens make the choices they do about communication processes in their lives. There continues to be little primary investigation into the generic social and cultural contexts of the user needs, and of how people perceive the use and value to them of a growing range of new communications technologies and services.

Much of the established literature in the field about why particular new services became successful (Everett M. Rogers, Geoffrey Moore, Tony Newstead), generally categorised by the term 'technological diffusion', applied to eras that were largely dominated by government owned carriers, where suppliers were institutionally less risk averse, and marketplaces were considerably less competitive than today. Newstead's ambitious work in reviewing the success factors of many 20th century communications technologies led to his hypothesis that there are five essential success criteria for success– it must be useful, easy to use, cost effective and socially and psychologically acceptable. Some of these factors have remained relevant but there are many more variables in the consumer choice mix in today's communication environment. This report suggests, in the context of communication futures, that a new paradigm is emerging to frame and understand the practices of Internet consumers towards 2010 based on the notion of 'disruption'.

Disruptive Technologies or Disruptive Users?

Harvard University's Clayton Christensen has offered new interpretations about product and service development related to users' responses. Christensen describes a trend apparent since the mid-1990s of the emergence of more and more 'disruptive' technologies that have

the effect of undermining established technologies and traditional business development cases. These new 'disruptive' technologies are typically smaller, simpler, and cheaper than their predecessors, which he differentiated from as 'sustaining' technologies. Disruptive technologies tend to offer little in the way of enhanced technical performance and their success appears to somewhat oddly be due in part to offering "discontinuous improvement in technology". Disruptive technologies, he argued, can eventually 'steal' secure, low end, low margin markets from incumbent players.

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.

1.1 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
PDAs	PCs	Smaller and cheaper	Poor processing &input-output capability
PC Internet	Print media	Greater richness, reach	Initially low richness
Mobile Internet	Fixed line Internet	Portability	Small size

Source: Funk, J. L. (2004). *Mobile Disruption*. John Wiley & Sons. p 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 that radically alter the economics of their industry. While Christensen's work essentially focused on case studies, his notion of disruptiveness needs to 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; amazingly busy auction sites such as eBay disrupting auction houses; burgeoning airlines like Virgin that process their ticketing online which undermines established travel agents; online share traders that have reintermediated and generally re-invigorated their businesses as a result of Internet based practices. The established music industry has been highly disrupted in recent years with the popularity of Internet downloading and peer to peer music file sharing. More recently, Voice over Internet Protocol (VoIP) services are emerging with considerable disruptive potential to established telecommunications carriers. Collectively these changes are leading to the emergence of very different kinds of communications environments.

This report argues that the prime source of such disruptiveness is not the technologies themselves but more so the end users who collectively are driving major structural changes in the marketplace towards 2010.

Human Factors

A broader range of human factors needs to be analysed to gain a better understanding of the factors that influence the take-up of new communications technologies and services. Some of these may be highlighted:

      a.   Lifestyle and personal enabling communications

      b.   Experience and cultural determinants

      c.   Usability factors

      d.   Affordability, cost, and perceptions of value

      e.   New externalities: the future of work

a.   Lifestyle and Personal Enabling Communications

There is little primary understanding of how end users make decisions about their interaction with communications technologies. Complex questions are not widely explored – i.e. who uses new communications technologies and services, how, for what purpose, with what meaning and perceived value to the users? Related issues include how does identity and the sense of self shape peoples' interactions with communications technologies?

Aspects of personal communication have become more important in a world that offers many more product and service choices than before. During the last decade, an unpredicted

trio of personal 'killer apps' emerged – electronic mail, text messaging, and searching via Google, now a verb. Why have these applications so brilliantly caught the imagination of so many end users across so many parts of the globe? What might their counterparts be by 2010?

The phenomenal initial success of email appears to lie in its inherent value and attraction as an electronic 'one-to-one' mode of communication. Either as institutionally based email, or as Web based conversations, email provides meaningful discourses in so many people's lives. Levine, Locke, Searls, and Weinberger argue:

> Millions have flocked to the Net in an incredibly short time….because it seemed to offer some intangible quality long missing from modern life… the Internet connected people to each other and provided a space in which the human voice would be rapidly discovered… Our culture's pulse is pounding with the Web…The spiritual lure of the Web is the promise of the return of voice. (2000: 39).

Similarly, Geert Lovink, a critical Internet theorist based in Amsterdam, has suggested there is an emerging global consensus about email's blessings:

> The quality of the email communication ranges from deep friendships, fierce debates, significant periods of silence, sudden flame wars and touching communications, resulting in all too human activities such as love affairs, marriage, e- business, and everything between rumours, gossip, casual talk, propaganda, discourse and noise. (Lovink, 2002: 176).

The unexpected but widespread take up of email demonstrates that recent 'winners' among the new technologies include those that provide avenues of engagement for people about what is important to them in their lives. Low tech email allows them to use the medium as a rich 'one-to-one' avenue for personal expression or the capacity to convey written messages, possibly with attachments, quickly and efficiently to widely dispersed 'one-to-many' member groups. Participants can be highly selective in responding, or choosing not to respond, to particular discourses offered in the form of email messages. This is not to ignore the many frustrations associated with email for some end users. The future of email to 2010 will be influenced the resolution of issues such as spam, phishing (being caught by fraudulent emails) and the personal management of information overload. The dimensions of the spam problem are clearly shown by the fact that in 2005 Big Pond estimates it transmits six million spam messages daily across its network.

Charles Britton on Short Message Service (SMS)

Charles Britton, Senior Policy Officer, IT and Communications of the Australian Consumers' Association, points out that diffusion of innovations is a large study but it is worth contemplating two networked communications technologies that "have succeeded in capturing the hearts, minds and wallets of Australian consumers."[5] These examples are Electronic Fund Transfer at Point Of Sale (EFTPOS) and digital mobile telephone Short Message Service (SMS).

> According to Britton, the characteristics that have driven EFTPOS have been:
> 1.   Risk management to limit consumer liability,
> 2.   Any-from-any utility,
> 3.   Widespread access to terminals,
> 4.   Ease of use,
> 5.   Trusted network operators,
> 6.   Little or no perceived cost to the consumer.

SMS is a primitive mechanism by which people can send very small text messages to each other via mobile telephone, and is, argues Britton, the accidental hero of Australian telecommunications. An extremely narrow channel, originally designed as a maintenance tool, it has exploded into a whole new revenue stream for the telecommunications carriers and service providers in the last few years. Critically this success came only after any-to-any text connection between carrier networks was achieved – something, Britton argues, to which "the industry in Australia had to be dragged by regulatory intervention."

> According to Britton, the characteristics that have driven the uptake of SMS have been:
> 1.   Availability in all networks
> 2.   Interconnection of networks for messaging
> 3.   Ubiquity in handsets
> 4.   Simplicity of operation
> 5.   Perception of cheapness
> 6.   Meets a basic consumer need (personal communication)

b.   Experience and Cultural Determinants

Technology needs to be analysed within the cultural context in which it is developed and used. Technology is *constructed*, and that construct reflects the values and priorities of the group responsible for its final form. We need to try to understand technological change and new media in different cultures by seeing culture as a social construction, and media forms as constructed cultural texts or artefacts**.** Logically in the evolution of a new product or service, consideration of the particular contexts of the users' environment should come before matters related to technology construction, or there ought to be some effective integration between the processes that lead to technological and social development.

Individuals in different cultures have vastly different frames of reference in terms of their response to the plethora of new media services now generally more widely available. The case of the extraordinary recent unique level of attraction to i-mode, the wireless phone craze, and lovers of DoCoMo within Japanese culture are particularly fascinating to try to explain. This is usually explained in terms of responses to the daily long haul of so many Tokyo train travellers, or to the unique industry dynamics along these lines:

> The vertical industry structure in Japan, non-existent in the West, enabled NTT DoCoMo to contract a large supply of mobile devices with large colour screens to support the new service model. An unmet fixed Internet market, a more open business model for content providers and the low usage cost of the underlying network all helped the case for success. (Coutts et al., 2003: 6).

The prime explanation here places the emphasis on business factors in explaining innovation that was a surprising disruption. An alternative view places more emphasis on the complexities within Japanese culture. According to Toshiya Ueno, the Japanese are no longer subsumed by "reflection and redemptive consciousness on the Japanese colonial and imperial past." Feeling guilt, or even showing care about the past imperialistic era, is apparently 'out' for today's Japanese youth - fashion and experience are 'in'. New media forms are intricately linked to the social and cultural boundaries that exist between youth and adults. A stark generation gap has seen the recent emergence of a hedonistic youth subculture much more attracted to wireless- based leisure forms than to conventional Internet services. Their cultural responses to new modes of communication are seen to be driven by a love of technological speed, an attraction to pop culture, and a widespread repulsion of boredom. So, argues Funk (2004), within one year of the start of i-mode, early in 1999, ringing tones, games, and screen savers already had a critical mass of users in Japan.

Another cultural case study emerges from the Philippines, the acknowledged 'text capital of the world', with 300 million text messages sent through the nation's mobile networks every day. There are 70 local fixed line operators in the Philippines, five cellular service providers, and about 80 percent of subscribers use pre-paid cards. Carriers charge P2.50 for every value added SMS and 20 percent goes to the developer who needs 30,000 messages for gross revenue of P15,000. Popular services include ring tones and personalised logos, flash text, games, and text for television shows.

How might we try to explain the extraordinary popularity of text messaging in the Philippines? The explanation surely has to reside within wider factors other than the strong motive of the service providers to offer a huge array of content options to attract big numbers in order to achieve an acceptable return. There are strong kinship ties within this

agricultural Catholic country where US$5 for messaging brings significant social cohesion. And the notorious Filipino social flamboyance offers friendly communications via clicks on the mobile key pad. And, like Japan, there are the perpetual frustrations associated with traffic problems which add to the attraction of diversions.

Pine and Gilmore's *The Experience Economy* (1999) highlighted the significance of different 'experiences' for individuals. They argue that experiences "represent an existing but previously unarticulated genre of economic output" (p.ix). Information services are not the foundation of the new economy but should be seen merely as processes of buying and selling. Successful companies, they suggest, can now create economic value by engaging customers in an inherently personal way- through the users' own *experiences.* The contribution of online pornography to Internet take-up in the mid 1990s provides evidence to support their argument. Towards 2010 good judgement about applications related to consumer personal and lifestyle experiences that work in cultural contexts are likely to have greater commercial significance than ever before.

Cultural Probes

The Smart Internet Technology CRC's research on 'cultural probes' exemplifies its focus on user-centred design (UCD). The 'cultural probes' approach has been developed by an interdisciplinary team at Melbourne University, notably Steve Howard, Frank Vetere, Martin Gibbs, and other researchers. This summary draws on their published work.[6]

'Cultural Probes' was developed as a way to gain rich insights into user experiences, their lived context, and how technologies are used in everyday life for mediated intimacy. By synthesising anthropology, cultural theory, emotional intelligence, and other fields it extends Human-Computer Interaction (HCI) into new domains. It envisages users as the co-creators of content, empowerment, peers, and social networks. The CRC team saw the need for interactive technologies that supported family and intimate relationships. People were already using the Internet, SMS, and other tools to enhance their relationships and social networks.

The CRC team used contextual interviews and digital anthropology fieldwork to better understand the power of exploratory technologies to redefine these relationships. The team's fieldwork occurred over a seven week period, during which interviewees and families were given a 'cultural probes' pack to capture insights. The pack included diaries, digital cameras, and scrapbooks. It was supported by contextual interviews for data-gathering on specific events and behaviours, and several weeks each for focus groups, design activities, and data analysis. These multiple research strategies encouraged the interviewees to provide deep reflections on technology use.

This process enabled the research team to collaborate with interviewees in the discovery process of qualitative data. The team also used brainstorming to develop prototype ideas as design sketches. Information visualisation techniques were used to synthesise new connections and patterns from data fragments. The CRC team reviewed the data on a weekly basis, and had integration meetings to draw out new insights and debate the various implications.

Consequently, the CRC team has developed several prototypes by using the 'cultural probes' findings as an innovation knowledge base. The portable Memorabilia Manager, comparable to a 'family blog', allows the experience of personal mementoes and couples' shared experiences. Constant Touch is a configurable push-to-talk device that supports presence-at-a-distance. The Family Digital Assistant helps to coordinate family activities and reduce miscommunication. Secret Touch enables people to 'hold hands virtually', and is a device to exchange tactile information. SynchroMate enables users to send SMS and email messages synchronously whilst the messages are being written. Hug At A Distance is an inflatable jacket that enables a reciprocal hug between partners over a long distance. The jacket uses two PDAs and WiFi technology to transmit commands and to thank the sender.

c.   Usability Factors

How important are usability factors in determining the possible take-up for new communications products and services? Logic would suggest that Newstead's 'ease of use' for consumers is a critical factor. Paradoxically, although the mobile phone's usability is regarded by many people as an annoying technology—i.e. the small screen, a cramped keypad to punch digits in, and the tedium of doing many manual dexterity processes—it has emerged as one of the great commercial successes of modern times.

The paradoxes of mobile usage need also to be related to market segmentation. Consistently the youth generation around the world has been the quickest and largest group to embrace the mobile phone as part of their lives. Hence the dubbing of this group in usability terms as the 'thumb generation'. On the other hand there is much evidence from consumer groups representing elderly citizens that usability factors are critical to their rejection of mobile hand sets.

Cecily Gilson of Senior Action Group Eastern Shore (SAGES) presented a case on behalf of elderly citizens at the Telstra Consumer Consultative Council (TCCC):

> At a recent meeting most members admitted that they had a mobile that they rarely carried, was not charged and they did not like them. The reasons given related to the actual instrument. Numbers were impossible to see without spectacles, the key pads too small for the non dexterous, impossible for arthritic hands, programmes are too complicated and quite unnecessary.[7]

Vic Marles, speaking in Sydney in June 2004 on behalf of the Telecommunications Industry Ombudsmen (TIO), pointed out that the greatest number of complaints received by the TIO related to the charging and usage of mobiles. She added:

> There is little evidence of a shift away from what appears to have become an established pattern of design usability for mobile handsets. The trend is not towards larger screens but the other way, towards smaller screens. *Choice* Magazine reported in its 2004 edition on 38 instruments and all were getting smaller and smaller.

Clearly though many users have been prepared to trade off functionality annoyances for the other key advantages of mobility and flexibility of usage.

Similarly research conducted within the Smart Internet CRC into user interactions with online banking showed that there are major bottlenecks for banking customers. A usability study conducted in January 2003 about the home loan web sites of two of the big four Australian banks, concluded in part:

> This study suggests that if banks wish their web sites to be seen as trustworthy and reliable "advisors" by their customers, or if they wish the sites to play a major role in attracting new customers into higher value relationships, then they need to concern themselves with the quality, and above all the usability of their web sites. The situation where nearly everyone gets the wrong answer for their borrowing power and where it takes some users over five minutes to find the on-line loan application form, hardly seems acceptable… Work is needed at both the detailed page design level (for the calculators and loan applications) and at navigational or structural level. Detailed usability testing of specific areas of bank web sites followed by redesign where problems are identified will undoubtedly yield a return in terms of more satisfied, less frustrated site users who are more likely to turn into customers or to remain as customers. (Barr and Craick, 2003: 6).

The usability paradox identified in this work is that despite the considerable array of usability problems clearly identified by these online banking customers, the rate of take-up for Internet-based banking continued to rise sharply. Westpac advised at the time of undertaking this research that of their total base of 4 million customers about 1.5 million were online and were adding 250,000 new online customers annually, though they were predominantly with basic rather than value-added banking services (i.e. home loans, personal loans, superannuation.)

Understanding the relative significance of usability factors needs to be assessed in the context of wider linkages between ICTs, personal communications, and lifestyle situations. Online banking services have expanded rapidly during the past five years, despite serious problems perceived with usability issues but also in spite of the high levels of distrust with Internet-based transactions and the regular publicity given to allegedly fraudulent practices. There also appears to be changing attitudes towards privacy within particular groups: the 24/7 obsessive workers now appear to be willing to offer suppliers a great deal of their personal information which hitherto they were reluctant to release and which suppliers store in their data bases. If the communication service offers a quick, convenient way of processing transactions then members of the 24/7 brigade seem appear willing to trade off more risks related to security problems than ever before. Another factor here, and one largely unresearched, is the apparent effect of points rewards systems (i.e. Fly Buys/Frequent Flyer)

which also seems to indicate new trade-offs with perceived risks related to invasion of privacy.

Usability, towards 2010, cannot be seen as a stand alone take up factor, but rather as integral to user perceptions of a risk/value assessment of their consumer decision making processes.

Amivox

Amivox was a multi-disciplinary project conducted during 2004, underpinned by collaboration between the User Environments and the Natural Adaptive User Interfaces Program, and having key input from a user expert on speech interfaces. The project developed an early prototype speech-activated mobile device incorporating an intuitive user interface. User-centred design was a key aspect of the project. User studies were conducted at the start of the project to ascertain attitudes and requirements for a speech-based mobile device. Observational studies of a mobile device, employing add-on speech output software currently available were conducted to inform the development of an appropriate feature set for the Amivox interface. Finally, usability testing of an early Amivox prototype completed the user-centred design approach to the project.

Blind people and people with vision impairment were the key user group studied in relation to usage of speech-based devices. Blind people are well versed in speech interfaces as they rely on speech output devices for information and communication. The results of the user studies with blind people have formed a valuable platform on which to build interfaces that are user-friendly and intuitive for the general population. In addition, an expert in speech interfaces, who is blind, was contracted to conduct the user studies, and to enable an iterative technical design process that streamlined the development. The direct links with the user community means that the research project was firmly anchored in a realistic and a potentially more marketable environment.

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d.   Affordability, Cost, and Perceptions of Value

The issues surrounding the take up of broadband services in Australia provides some useful insights into the relative significance of cost factors for consumers.

In 2002 Australia's take-up for broadband was at only 1.8 per 100 inhabitants. Frustrated consumer group advocates argued that broadband prices were far too high to ever generate widespread demand. The Australian Competition and Consumer Council (ACCC) argued that Telstra inhibited competition in this area because it was intransigent on reducing its wholesale and retail prices. The Telstra pricing strategy appeared to presume that customers would eventually come to accept the high prices when they became so frustrated with slow speed or were so annoyed by being charged additional fees for exceeding their download limits. In October 2004 Justin Milne, BigPond's managing director, continued to argue that he

could not see how there could be any fall in the wholesale price of broadband (Crowe, 2004). He stressed that BigPond would continue to maintain the usage meters that levied extra charges on customers who downloaded large amounts of information. It seemed that the short term future of broadband take-up was only as a small niche market service.

Then, in February 2004, Telstra responded to the mounting pressures for change, and announced a reduction i.e. a A$29.95-a-month basic digital subscriber line with an imposed speed limit of 256kb and a download limit of 200Mb. Wholesale rates were also halved. Competitors were forced to follow Telstra and new discount offers flowed freely. The result was that the March 2004 quarter produced the largest ever quarterly increase in broadband take-up in Australia. Telstra's broadband subscriptions for the 12 months to 30 June, 2004 rocketed from 361,000 to 803,000 (Nicholas, 2004). Telstra then brought forward its market prediction of having one million broadband customers to July 2005.

Clearly in this case, and in these circumstances, reduced consumer pricing was a 'critical inflection point' (Grove, 1999) and the substantial price reductions of February 2004 produced a catalytic effect on broadband take-up. Plenty of customers accepted a trade-off in terms of speed and limits to downloads, because the perceived cost to them presented became acceptable value for money. The issue here is not as simple as suggesting that a radical price reduction for a particular service automatically generates bulk business though it clearly helps. Mobile telephony, for instance, has experienced a boom phase despite call costs to consumers being roughly treble those of fixed line costs. There will be a plethora of cost issues related to price inflexion points in the future for new content options related to mobiles, VoIP services, multiple delivery modes for broadband services, digital television sets and services, and other emerging applications.

e.   New Externalities: The Future of Work

Several of the key factors driving changes related to the nature of work are likely to have major effects on communications practices in the future. Among the most critical change are the greater casualisation of work, the continuation of downsizing, outsourcing practices, and the likelihood of substantial hikes in fuel prices. The overall trend towards greater de-institutionalisation of workers is most likely to continue well beyond 2010.

During the 1990s, Thomas Malone and Robert Laubacher of MIT's Sloan School of Management proposed several new business models that were centred on communications

technologies. They proposed the emergence of an Internet based 'e-lance economy' ('e' for electronic, 'lance' as in freelance). By *e-lance* Malone and Laubacher mean "electronically connected freelancers who join together into fluid and temporary networks to produce and sell goods and services."[8] They forcefully argued during the dotcom boom that an e-lance economy would bring about fundamental changes to virtually every business function. Supply chains would become ad hoc structures, assembled for particular projects, and disassembled when projects end. Specialised manufacturing capability would come in from a variety of brokers, design shops – or even consumers.

According to Malone and Laubacher, new communications technologies enabled us to return to the pre-industrial organisational model of small, autonomous businesses. A major difference in this present phase of capitalism is that these businesses can tap into "global reservoirs of information, expertise, and financing." They point to a range of factors driving the devolution of large permanent corporations into flexible, temporary networks of individuals. Business, according to them, would increasingly come to operate in an unprecedented marketplace of adaptable suppliers and organisations, where consumers and citizens would revel in a highly flexible working environment.

Malone and Laubacher saw the Internet as "the greatest model of network organisation that has yet emerged." This belief led them to make the heroic prediction of the ultimate "obsolescence of big business." Whilst their writing was clearly a product of the Internet euphoria of the times, the pitch that an increasingly 'flexible' work force would become more dependent upon home based personalised services, is a major strategic consideration for developers.

Many of the changes related to the Internet towards 2010 will centre on new lifestyle models related to work-home interactions.

6. Social Networks
Darren Sharp

The geeks are excited about social networking because they never give up believing that they can apply their favourite tool, an algorithm, to the processes of human nature. The VCs are excited because they see so many eyeballs flowing to these sites, and if just one site turns out to be a Google, or a Yahoo, or an Amazon, or an eBay, somebody is going to get filthy rich. Everyone interested in studying human behaviour is excited -- never has so much up-close-and-personal data been so accessible. The masses are excited because, well, hell, their hormones are pumping and there are a lot of pretty pictures out there.

Andrew Leonard — Salon, 'You are who you know', (2004)[9]

I don't use social networking. Social networking is great for people who are isolated, people who don't have access, people who are working their way up, people who are looking to socialize. Once you've kicked around in the system for a while or had any public success, the object of the game is much more filtering out social contacts than making new ones. Like every one else, I was invited on to Friendster, Orkut etc and eventually I just had to delete my membership on all of them because I just can't deal, I get too much email as it is.

Douglas Rushkoff—Interview with Author, (2004)[10]

Online communities have existed since the early days of email, bulletin boards, and IRC (Internet Relay Chat) channels. Sherry Turkle's research on 'negotiated identities' and Howard Rheingold's work on the ability for 'virtual communities' to re-enchant the public sphere, display optimism about the empowering potential of life in 'cyberspace'. Internet-based communications have always been used for social networking, whether through early online communities such as the WELL (Whole Earth 'Lectric Link) or text-based role-playing adventure games like MUDs (Multi-User Dungeons), and MOOs (MUD Object Oriented).

In the wake of the dotcom crash the Internet is moving into a more mature phase of development. For those with privileged access, the Internet has become part of the background to life in the 21st century. After more than a decade of widespread uptake, people are being socialised into taking the Internet for granted, leading to higher degrees of new media literacy as users grow accustomed to the changing social environment. Canadian social network analyst Barry Wellman has charted this evolution of the Internet as a social phenomenon, and has shown how it plugs into existing social structures and maps onto everyday life (Wellman & Hogan, 2004).

Wellman makes the important distinction that "attention now focuses on the broader questions of the 'Internet in society' rather than on 'Internet societies'."[11] There is growing potential for the Internet of 2010 to cater to a wide variety of social practices as the cost of hardware falls and the ubiquity of mobile phones increase, along with the growth in WiFi and broadband connectivity which collectively provide more access points.

A Platform for Social Praxis

Since 2003 a new wave of primarily American startups have re-ignited enthusiasm in dotcom firms by designing Social Networking applications that enable users to communicate via the Internet in new ways. Social Networking can be defined as any set of activities that enable many-to-many social interactivity to take place via ICTs, whether via the Internet, mobile, PDA or any other device. The first batch of Social Networking Services (SNSs) like Friendster, LinkedIn, and Orkut became major attractors for a range of early adopters. These included workers in the high-tech industries, political activists, and various interest groups who quickly recognized the potential for Social Networking tools to augment real-time social interactions. Weblogs or Blogs are web diaries that streamline online publishing for non-technical users. Wikis are simple applications that allow users to update Internet content in real-time, provide feedback, and enable collaboration across distributed teams. Sites like

Meetup.com provide social tools for "communities of practice" to facilitate face-to-face meetings across cities the world over.

Social Networking Taxonomy		
Class	**Function**	**Examples**
Social Networking Service (SNS)	Applications that allow users to find links with people through mutual friends or acquaintances, build profiles and update address books.	Friendster, Orkut, LinkedIn, Ryze, Tribe, Match
Blogs	Simple content management tool that enables non-expert users to build easily updateable web-diaries or online journals.	Blogger, Typepad Moveable Type, LiveJournal
Wikis	Collaborative software that allows users to add content but also allows that content to be edited by anybody.	Wikipedia, DisinfoPedia, LinuxWiki
Instant Messaging	Internet client that allows online conversations to happen in real-time between two or more users.	AOL IM, Gabber, Yahoo! Messenger, Gaim, Trillian
RSS Feeds (Really Simple Syndication)	Set of XML based web-content distribution and republication protocols used by news sites and blogs.	NewsGator, Feedster, FeedDemon

Online Social Networking is gaining ground as an important global trend, for those with access to such technology, towards new networked models of social interaction that weave in, out, and around to form the very fabric of the Internet. Clay Shirky, a professor at New York University and an authority on Social Networking software simply defines it as "software that supports group interaction."[12] The radical nature of Social Networking software, notes Shirky, lies in its many-to-many two-way mode of communication that transcends point-to-point and two-way media like telephone and email and one-way outbound models of traditional broadcasting such as television and radio.[13] Stowe Boyd, consultant with Corante Business Intelligence (www.coarante.com), believes that for applications to qualify as 'social software' they must provide at least one of the following: 1.) support for conversational interaction between individuals or groups; 2.) support for social feedback; 3.) support for social networks.[14]

The driving forces of two-way communications technologies uptake have been popularly described using mathematical models of network growth. Metcalfe's Law describes the value growth in networks and states: "for two-way interactive communications, such as email or p2p between computers, the value of the network rises proportionally to the square of the number of users."[15] As individuals connect to the Internet they indirectly benefit other users through 'network effects'. This notion of value creation in two-way networks contrasts with traditional models of supply and demand where increased quantity of something leads to decreasing value.[16]

What distinguishes Social Networking applications from their two-way predecessors is a combination of factors including a mature web infrastructure, the emergence of web-native platforms like Blogs (personal web-diaries), Wikis (web pages any user can edit), and ubiquitous access among certain groups of users.[17] Taken together with ease of use, these factors enable any user to develop or hook into group-forming networks, whether mobilised strategically or ad-hoc, depending on the nature of the project and the needs of the people in question.

Group-forming networks are socio-technical systems that enable users to create and maintain group affiliations. This can be anything from a mailing list, newsgroup or chat room. However the new wave of Social Networking tools explicitly facilitate group affiliation through applications like Social Networking Services (SNSs), Blogs, Wikis, and Instant Messaging (IM). David Reed from MIT's Media Lab has formulated a scaling law that articulates the value of technical network architectures that enhance social or group-forming networks.

According to Reed:

> Networks that support the construction of communicating groups create value that scales *exponentially* with network size, i.e. much more rapidly than Metcalfe's square law. In networks like the Internet, Group Forming Networks (GFNs) are an important additional kind of network capability. A GFN has functionality that directly enables and supports affiliations among subsets of its customers. Group tools and technologies all have a common theme—they allow small or large groups of network users to coalesce and to organize their communications around a common interest, issue, or goal.[18]

The viral nature of online social networks augurs a future power shift as users begin to embrace the 'collective intelligence' of their surrounding social environment. Some early adopters have begun a move away from traditional media sources and rely on their network of friends, family, and fellow travellers for reviews, feedback and advice about the latest movie, book, restaurant or ISP.

The Strength of Weak Ties

American sociologist Mark Granovetter is well known for his article 'The strength of weak ties'.[19] Granovetter argues that weak ties such as the connections between colleagues and acquantainces, are more important for personal advancement, such as getting good jobs, than the strong ties of family and friendship.

Member forums like Whirlpool (www.whirlpool.net.au), Infochoice (www.info choice.com.au) and PhoneChoice (www.phonechoice.com.au) already enable consumers to call on weak ties to compare ISP, banking, and telecommunications providers for service, price, and quality. These early warning systems give managers, application developers, and marketing personnel the opportunity to understand the potentially 'disruptive' nature of socially networked consumers and assess their impact on emerging product and service lines towards 2010.

Online Social Networking 'crossed the chasm' in 2003 during the lead-up to the US Democratic Presidential primaries, when Howard Dean's supporters began to spontaneously use Meetup.com (www.meetup.com/) for political campaigning. Meetup.com provides a free service which enables users to facilitate face-to-face meetings between people with shared interests. Dean backers from across the United States started using Meetup.com to rally support on and offline and aid in fundraising efforts. This novel approach to grassroots political campaigning was unique in its ability to create a space for a new generation of younger voters to coalesce and provides a model for future Social Networking innovations.

The blogging craze is showing signs of becoming mainstream following its success as a vehicle for political campaign fund-raising (Trippi 2004), eyewitness accounts of the second War in Iraq (Pax, 2003) and coverage of the 2004 US Presidential election (Gillmor, 2004). Blogging continues to have widespread effects in the fields of journalism and politics as thousands of 'bloggers' exchange ideas, post their daily thoughts and commentaries, acting as filters to the hoards of web surfers suffering from information overload. Blogging has become a social force in its own right generating its own lexicon: the 'blogosphere' (the blog ecosystem), with some star bloggers (web diarists) commanding an audience in the tens of thousands. In what *The Washington Post* labels the "services-and search race" Microsoft launched MSN Spaces (www.spaces.msn.com) at the close of 2004 as a competitive measure against Google's Blogger (www.blogger.com) online-journal service.[21]

Wikipedia (www.wikipedia.org), the collaborative encyclopaedia project, has become another notable many-to-many application which came from leftfield in 2002 to become the world's largest and most successful online reference site. Any user can contribute content, make changes and revise articles based on a peer-reviewed system of editorial control. These socio-technical systems will increase in complexity and scale towards 2010 as users continue to creatively adapt new tools to produce knowledge, leverage collective intelligence, and build social capital.

Smart Mobs

Virtual communities pioneer Howard Rheingold's recent book *Smart Mobs* (2002) examines the dialectical relationship between human behaviour, technological innovation, and social change. In a potential 'future landscape' of pervasive, mobile, location-sensitive Internet, Rheingold points to the growing army of young mobile phone users as leading the charge of a new social phenomena he calls 'Smart Mobs': groups of people "who are able to act in concert even if they don't know each other."[22] The growth of 'texting' and next generation mobile phones have created the space for a range of social interactions to occur beyond the place-boundedness of the home, office, or school. Through Internet-enabled devices like PDAs and 4G mobiles using WiFi, people are able to 'communicate' and 'cooperate' in ways never before possible.

Rheingold on Smart Mobs and the Internet
During an interview with Rheingold, he foreshadowed what a peer-to-peer (p2p) socially networked world might look like towards 2010:

> Billions of people – certainly not just the wealthy – will carry and wear devices thousands of times more powerful than today's personal computers, linked at speeds far higher than what we consider to be broadband. Many if not most of those people create and trade content and applications as well as consume them. Fifteen year olds in Brazil and Pakistan will compete with Redmond and Hollywood.[23]

Christine Satchell's doctoral research for the Smart Internet CRC examined young people's use of mobile phones. Her study focussed on the role mobile technologies play in the formation and maintenance of social networks. During an interview Satchell discussed how the culture of mobile phone use revolves around the central theme of connectivity: "social networks are formed through the use of technology. What came out of my research interviews was that mobile phone use is integral to group status."[24] In terms of generational change Satchell sees today's youth being defined by their immediacy of presence: "People can spontaneously form social networks and come together at any time for a specific purpose and that's the idea of swarming."[25]

Articulating the Social Infrastructure

Social Networking tools signal another phase in a long line of network-enabled applications. The new class of social tools available are distinctive for enabling users to visibly articulate connections between groups of friends, colleagues, and sometimes strangers. Beyond technical considerations social tools cannot function without a proper system to represent user identity and mediate trust between different members of each diverse community formation.

Danah Boyd, a social networks researcher at University of California (Berkeley), spent over a year interviewing people about their experiences using one of the earliest Social Networking Services, Friendster (www.friendster.com). Her doctoral research focussed on the social issues that arise when people publicly articulate their social relationships. As she explained during an interview: "None of this is new. It is critical to always remember that. Social technologies have a history and an evolution… People want a way of controlling who they have access to and who has access to them. They want to find "people like them" on at least one axis. The evolution is completely connected to conceptions of trust, reputation and control. These technologies are moving the evolution along, but they are not the answer."[26]

While Social Networking Services (SNSs) are seen by millions of users around the world as a fun and exciting way to make new connections with friends of friends, as Boyd's findings make clear, it was not long before sites like Friendster began to raise the ire of many. Like any technology, Social Networking Services (SNSs) attract the full spectrum of human users. It wasn't long before hate groups began racially vilifying African American and Asian groups on Friendster. Other boundaries were crossed, and socially awkward encounters arose between teachers and students, co-workers and employers. Boyd spent time tracking the formation of Friendster communities and her findings revealed crucial flaws behind many of the developers' assumptions about how people mediate their identities and relationships online.

Danah Boyd: Technology-centric Projects Bound To Fail

> Technology is not creating a separate universe, even if the science fiction folks want to dream it so. Technology is aiding and abetting already present human needs and desires - community, attention, power, money, etc. Understanding human behaviour is a clear key to understanding technology and human behaviour…. We don't understand how technology intersects with society; we're not trying to situate social technologies in social practices…. There are no Internet users. There are people and they use technology and the Internet as a tool in their everyday lives. They connect not to the Internet, but to their loved ones and to a collection of knowledge. Information, knowledge and media spread in a peer-to-peer fashion. Fashions can be measured by watching these networks. Sociable technologies are not about the individuals, they are not about usability… they are about communities and social practices. You cannot participate in a social technology by yourself; you have to be a part of a community.[27]

Boyd is not alone in pointing out the importance of factoring social context into technology design. Bonnie Nardi and Vicki O'Day's book *Information Ecologies* (1999) uses the language of ecology as a metaphor to describe the informational space as an ecosystem. Widely applied in library science and knowledge management, Nardi and O'Day's ethnographic studies reveal how technical systems are 'structurally coupled' to people, practices, and values in any given local environment. Such Information Ecology perspectives view the technical and social realms as interdependent aspects of a whole system that interact with each other in profound ways.

Social Networking relies on trust and reciprocity, the social glue that binds take-up of Internet-related applications and services. Social relationships play a fundamental role in determining which products to buy, which merchants to transact with, and which political candidate to vote for. Informational pressure, deceitful conduct, and the challenge of evaluating quality, have spurred the development of reputation management systems. Slashdot, eBay, ePinions, Amazon, and Google all make use of collaborative filtering, user-recommendation engines, or shared judgements of quality. These reputation systems provide early examples of how future users may form communities of interest, whether comprised of friends, strangers, buyers, or sellers, and how they rely on cooperative forms of social interaction.

Relationships Inc.

The present crop of Social Networking Services entered the marketplace around 2003 and uber cool sites like Friendster rode on a wave of media hype scoring new user registrations by the millions. These figures paint an inaccurate picture of genuine user uptake, as retention rates remain difficult to measure. Maintaining customer loyalty has become an elusive goal, as users flock to new networking services as the fashion dictates. Data on Australian usage patterns is few and far between. Journalist Brad Howarth states: "LinkedIn claims 700,000 users globally, but at the start of June (2004) had only 8124 in Australia."[28]

Rachel Dixon has a unique understanding of the Australian Internet space as Managing Director of Massive Interactive (www.massive.com.au), a successful Sydney new media agency. The Federal Government recently set up the Digital Content Industry Action Agenda and appointed Dixon to the coveted Strategic Industry Leaders Group. During an interview Dixon proffered her views on the current generation of Social Networking Services from an Australian perspective: "I choose the networking events I want to go to incredibly carefully and I generally go on the basis of the people I know who organise them. I get 50-60 emails a week from things liked LinkedIn and I don't even read them. I don't think they're of tremendous utility at all, in fact I think there are some significant privacy issues."[29]

Dixon can be added to the chorus of critics that have raised concerns about privacy since the fall out over Google's Gmail (www.gmail.com), the highly anticipated email service that uses the data from scanned email messages to send users targeted advertising. Danah Boyd's doctoral research on Friendster communities has revealed that important boundary issues, in terms of mediating exchanges between 'insiders' and 'outsiders', have become a key inhibitor to ongoing use of these services. Some astute users of Social Networking Services

(SNSs) have long questioned the uses to which their personal information is being put. Data mining and direct marketing have become part and parcel of generating revenue online. Google has built a global empire out of such activities, and elevated online advertising to an art form. Judging by the scale of new registrations to networking sites, many users are quite comfortable exchanging high-level personal details for access to the latest service offerings.

Show Me The Money!

Beyond the carefully scripted press releases and hyperbole typical of Internet companies, few of the consumer-focused Social Networking Services profiled have performed well in the marketplace. The business-oriented service Ryze[30] and the personality quiz site Tickle[31] are the most notable startups working in this space to have turned a profit. Any new Internet service will attract sceptics who question evangelists' claims of potential future growth. Some pundits like Andrew Orlowski, a dour Internet columnist for *The Register*, have deridingly accused Social Networking of being a short-lived fad, an unfortunate return to 1990s hysteria whipped up by Silicon Valley venture capitalists and the media.[32] Unsurprisingly, certain quarters of the Internet community project an aura of reticence in order to atone for sins of the past.

Social Networking sites employ a number of common business models to capture the attention of target audiences in what has become a highly competitive marketplace. Early networking sites like Friendster offered users the chance to participate for free in the hope of scaling quickly enough to reach a tipping point attractive to advertisers. Many dating (www.match.com) and reunion (www.australiansreunited.com.au) sites offer free registration in the hope of enticing users to subscription-based packages that incur a nominal payment to access value-added services. As with all commercial membership-based services, Social Networking companies engage in varying degrees of data mining. Getting users to upload their personal details and network of contacts gives marketers access to a data goldmine aiding the process of demographic profiling to determine likely markets for new services.

Stowe Boyd writes a regular column for *Darwin Magazine* (www.darwinmag.com) about the commercial viability of Social Networking Services. He has developed a simple quadrant that articulates four major business models for extracting money from people and organisations intent on using these tools. According to Boyd: "The important question turns out to be who is paying for the social exchange to occur, and who is invited to the party where the exchange takes place".[34] Boyd's quadrant divides along 2x2 matrices of "Who Pays?" which at one end has the individual, and the other, the enterprise. The "Who is Invited?" dimension splits between public vs. public access.

Boyd's matrix reveals a range of commercial spaces that businesses could take advantage of by leveraging the power of social networks in a variety of creative ways, as shown below:

Stowe Boyd's Who Pays? Who is Invited? Matrix[35]

Sector 1 "Seibel goes Social" is when an enterprise purchases Social Networking software as a means of augmenting existing functions like sales and business development. This is the business model for companies like Socialtext (www.socialtext.com) and Spoke Software (www.spokesoftware.com).

Sector 2 "Social Supply Chain" relates to corporate sponsorship of affinity groups and relationship management. Companies here develop customer social networks around goods and services or exploit supply chain networks to increase productivity. A good example is the Vogue Forum (http://forums.vogue.com.au/), an online community dedicated to fashion that reveals buying habits of its core demographic.

Sector 3 "iTunes Goes Social" is where individuals pay for value-added subscription services like dating, classified ads (www.craigslist.org), job search, etc. Boyd suggests online music retailers could offer premium services that utilise social networks to provide advanced features like advice, reviews, and better search functionality.

Sector 4 "Pay for Involvement" is where individuals pay for access to closed communities of interest whether along lines of ethnic, religious, political, or sexual identity. Boyd points to Suicide Girls (www.suicidegirls.com) a counterculture community with revealing photos and blogs, as a profitable model to follow.

(Adapted from Stowe Boyd, 2004. 'Handicapping Social Networking Business Models', *Darwin Magazine*).

Above all else, Social Networking is about human communication, and reflects the degree to which we use technology to meet deep-seated emotional needs. People will continue to develop, discard, mutate, and tinker with the tools that enable these processes to unfold in a way that best reveals their inner essence to the outside world. Technology designers who understand the nature of networked communication: its limitations, ambiguities, and advantages, might succeed where others have failed. Ultimately users will go on a journey together with their friends. After all, to be human is to be social.

7. Patient-centred eHealth
Paul Turner

eHealth is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology.

Gunther Eysenbach—'What is e-health?' (2001)[36]

Availability of, and access to, reliable information is also crucial for health promotion and prevention…there is a great deal of information available from evidence-based research and other types of evaluation, but gathering, assessing, summarising and disseminating it requires coordinated efforts….Real added value can be gained through systematic exchange of information and collaboration regarding the development of infrastructure for reliable information systems.

European Commission—'Health Telematics Working Group of the High Level Committee on Health' (2003)[37]

The eHealth Landscape

Australian eHealth initiatives have evolved in response to diverse forces that include advances in the medical sciences, increased economic prosperity, and the changing socio-political expectations of healthcare services. Systems complexity now poses a challenge to healthcare staff: how to support improvements in the quality of care for all in an economically sustainable manner.

Current solutions are often fragmented and piecemeal, and are compounded by increasing care costs, clinical workloads, and administrative overheads. There is widespread recognition, due to the potential for socially and economically destructive effects, that meeting ongoing cost increases can be a short-term fix only. The increasing disparities in the access, availability and efficacy of care delivered to different citizens must be addressed. Looking towards 2010 and beyond, current eHealth systems are not sustainable into the future economically or clinically.

Resource and Information Issues

A major resource issue is the cost increase related to changes in the nature of, and demand for, care delivery and prescribed medicines. Current health care systems remain generally poor at collating, analysing, and sharing available clinical and administrative knowledge and information, both within and between different parts of the health sector, at individual and population levels. The evidence base underpinning many clinical interventions at these levels is also a concern. There remains little or no research into the effectiveness of particular types of intervention and no clear agreement on what is meant by 'good' information or 'quality care'. Finally, there are questions over the lack of patients' access to their medical information and to the transparency of information on the quality of care delivered by health professionals and their institutions.

Health Professional and Patient Issues

Healthcare institutions find it increasingly difficult to attract and retain suitably qualified clinical and career staff across the range of services delivered. Advances in the medical sciences have led to increasing specialisation. This has made it difficult for existing health professionals, particularly in primary care, to 'stay up to date'. These professionals also face the challenges of maintaining appropriate education and training, increasing workloads, and pressures to perform. This results in variability of healthcare expertise and levels of delivered care.

Patient demand for services currently outstrips supply. In the near-term future, the challenge of ageing populations means that patients are more likely to require treatments for chronic or long-term conditions such as dementia or stroke. The failure of health systems to provide continuity of care, to adequately address patient privacy, confidentiality and consent, or to respond to patient feedback, is a major concern.

Clinical Issues

Key advances in clinical technology include:

- *Molecular and gene-based diagnostics and engineering* that are improving the early detection and treatment of diseases and heredity pre-dispositions.

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- *Pharmaceutical and Biotechnology advances* that are producing 'smart' drugs and foods that have the capacity to alter health, performance, and behaviour 'on-demand', although questions over the potential for adverse drugs interactions remain.

- *Lasers, medical implants, and the miniaturisation of devices* that are facilitating minimally invasive or non-invasive procedures.

- *Synthetic tissue growth, organ, and cloning banks* that are enhancing human transplantations and facilitating the stock-piling of repositories of an individual's cells that can be subsequently grown into tissue or organs as and when required.

- *Neuro-generation* that is leading to the capability of medical science to repair or grow spinal cord materials and complex nerve tissues e.g. stem cells.

These emerging technologies pose numerous legal and ethical dilemmas. They may fail to resolve current problems, including the over-reliance on anti-biotic and other prescription medicines, the high rate of medical and medication errors, and the overall issues of quality

and safety of care delivered. Healthcare professionals urgently need system responses to major disease threats such as AIDS and SARS.

Health Model Issues: Quality Care and Patient Empowerment

Current healthcare systems face a dynamic and multi-faceted crisis. Looking towards 2010 and beyond, without significant change, this trajectory will be one of increasing disparities in terms of care available to different patients, rising costs, mounting clinical work-loads, and increasing complexity in the demand for healthcare services. The looming crisis has prompted healthcare professionals to question economically rationalist models and the technologically determinist assumptions of current eHealth systems. The range of service provisions include:

- *Primary Care:* (General practitioners, pharmacists, dentists etc.) plus other individual and community services e.g. preventative medicine, self-help groups, opticians, chiropractors, and numerous alternative medicines and treatments etc.

- *Hospital and Acute Care***:** Ambulance, accident and emergency, surgery and elective procedures, palliative Care, specialist clinics, mental health etc.

- *Aged and Community Care:* (Residential, community, and home-care) plus community nursing, child-care, drug programs, support for people with disabilities).

- *Population Health Care:* Epidemiology, preventative programs, health awareness and response to major health crises e.g. AIDS, famine etc.

The Smart Internet Technology CRC recognises that user-centred design (UCD) insights are crucial for designing and implementing robust eHealth systems that can 'do more and better with (relatively) less'. This UCD approach differs from current eHealth work that is techno-centric in understanding how end-users interact with complex systems. The emergence of consumer pull from 'Internet positive' patients defies delivery models that make the patient a passive recipient. A patient-centred health system must address the issues facing patients, health professionals, and the health care system now and into the future.

The CRC's UCD approach is also used to evaluate progress on quality of care criteria. Advocates of current eHealth solutions offer simplistic arguments around how the benefits generated by Information and Communications Technology (ICT) will be realised. UCD research shows that current eHealth solutions are often fragmented: various approaches are advocated, each based on different measures and types of evidence on improving quality of

care. UCD can help healthcare professionals understand what the consequences might be for patients, health professionals and the system as a whole.

Patient empowerment remains a contested issue. Some patients are willing and able to take on new responsibilities, and when they do, this leads to improved quality of care. It remains unclear whether the impact of the availability of clinical information via the Internet is wholly positive for patient-doctor relationships. However, there is a clear role for patient empowerment when linked to the growth of self-managed care and use of alternative medicines.

Evidence-Based Medicine (EBM) and Clinical Practice Guidelines

Evidence-Based Medicine has emerged as a powerful scientific paradigm for healthcare delivery and quality of care evaluation. The CRC has identified a number of problems with achieving Evidence-Based Medicine including: clinicians' lack of skills, knowledge, and time to obtain the latest evidence; that scientific evidence in many areas is still lacking or partial; that existing practice guidelines fail to meet quality criteria and are not based on the latest EBM; difficulties in translating EBM guidelines into clinical practice; resource issues that impact on the care available; that different cultural values influence EBM interpretation; and that there has been only limited study of EBM outcomes for patients rather than clinical practices.

EBM delivery is further complicated by scientific debates on clinical practices, the patient-doctor relationship in healthcare delivery, and systemic interactions. The scientific perspective argues that EBM practice should be placed above clinical autonomy to ensure standardised excellence in care delivery that is based on the most up-to-date sources. This provides a tangible direction toward future visions of healthcare. The relationship and systems perspectives both point out that healthcare delivery is a process that involves interactions and relationships that exchange information. These should be the focus of investment and continual improvement.

EHealth and health informatics are key enablers for this transition. Yet the best ways to generate these innovative approaches are not always transparent. The transformation of Australia's healthcare system to 2010 involves an extremely complex, dynamic, and multi-faceted interaction at individual, organisational, and systems levels. The CRC's UCD approach remains crucial to identifying community outcomes that will be economically sustainable.

Professional Development

Professional Development (PD) is vital for healthcare professionals during this transitional period. Current approaches include individual-based education and training that emphasise 'professional pride, self-regulation and ownership by clinicians.' Continuing medical education (CME) and self-directed learning are two other viable strategies.

The CRC has identified a number of problems with these approaches including: limited evidence on the effectiveness of PD approaches both generally and in particular settings; limited investigation of their cost effectiveness; and that the impact of PD on clinician competence in delivering quality care and improving patient outcomes is unclear. Further evaluation of PD approaches is required.

Assessment and Accountability

Current assessment and accountability systems provide clinicians with data that compare their performance against others. However the assumption that this process will improve the quality of care for patients is potentially problematic. Much of the data available is of questionable validity and reliability, with measurements tending to be incomplete, simplistic, and that may be potentially misleading. Clinicians and patients may also have divergent responses to this data. From a patient perspective, there is evidence that they do not use, understand, or trust the data. From a clinician perspective, there is strong evidence of resistance and suspicion from clinicians towards this type of data.

Information Communication Technologies: A Panacea For All Ills?

In an Australian context eHealth initiatives have been identified as major drivers for overcoming the current healthcare crisis. The roll-out of eHealth systems is complicated by other factors that include changes to Medicare, healthcare funding arrangements, medical insurances, and the legal and regulatory environment. The major challenges to eHealth implementation are summarised below.

ICT deployment raises a number of clinical, socio-technical, and legal challenges that have become increasingly evident as the implementation of more sophisticated ICT solutions have met with mixed success. Even where ICT is adopted this is not necessarily an indication of actual use or changed work-flow practices. A CRC review of health informatics literature found it contains little or no questioning of the underlying assumption that benefits will accrue to patients if the obstacles to ICT roll-out are overcome.

Barriers to an interoperable healthcare system include: the lack of a coordinated national approach to the provision and development of a common infrastructure and standards; to privacy, security and patient records; and low levels of IT literacy in the health workforce. The CRC's UCD approach highlights that unless eHealth systems are designed and implemented on the basis of a detailed understanding of the end-users and their environments, benefits may fail to be realised. The complexity of eHealth systems means that detrimental, unexpected, or 'second order' effects may occur.

Challenges To eHealth Implementation

- **National Level:**
  - Lack of clinical and technical standards and systems for integration and interoperability, and for ensuring identification, security, consent, and authentication while maintaining privacy and data confidentiality
  - Lack of clarity around data ownership and issues of legal liability
  - Challenge of change management and how to overcome the system 'inertia to change'
- **Health Professionals:**
  - Variability in access and use of ICTs and related skills across the workforce; key problems include user acceptance and changed work-flow practices
  - Education and training issues
  - Limited data quality
  - Information overuse, under-use, and misuse
- **Patients:**
  - Information access, understanding, and responsibility
  - Privacy, security, authentication, and consent

Future Visions of Healthcare Systems

Most future visions of healthcare systems recognise the need to become more efficient, safer, knowledge-based, patient-centred, system-minded, and to provide universal, accessible, and affordable care. These new rules are summarised in the following table.

Current Health Approach	New Rule
Care is based primarily on visits	Care is based on continuous healing relationships
Professional autonomy drives variability	Care is customised according to patient needs and values
Professionals control care	Patient is the source of control
Information is a record	Knowledge is shared and information flows freely
Decision-making is based on training and experience	Decision-making is evidence-based
Do no harm is an individual responsibility	Safety is a system property
Secrecy is necessary	Transparency is necessary
The system reacts to needs	Needs are anticipated
Cost reduction is sought	Waste is continuously decreased
Preference is given to professional roles over the system	Cooperation among clinicians is a priority

Table: 'Transition to New Rules for Healthcare Systems' (Institute of Health, http://www.iom.edu/object.File/Master/12/539/0.gif).

These new rules also have impacts and implications at the following three levels:

• **Care**: A patient's experience of care should comply with the principles of quality care. Healthcare professionals are able to work cooperatively with one another and with patients to deliver knowledge-based customised care.

• **Organisation**: Healthcare professionals need to redesign care processes to ensure they embody 'best practices', improve workface skills, enhance knowledge and team performance, and ensure coordination of care delivery across services. This also implies performance metrics and effective measurement of care delivery outcomes.

• **Healthcare Environment**: Changes are made to malpractice/tort systems, payment and reward mechanisms are revised for healthcare professionals, and there is increased transparency of the healthcare system and its performance.

There is a high level of agreement that the preferred future vision of healthcare delivery by 2010 and beyond will involve using ICT systems to:

• Manage new and existing patient, medical and administrative information and knowledge in a manner that will increase the evidence base of care and other decision-making. The role of decision support tools, especially at the point of care will become increasingly standard.

• Enable the development of a uniform electronic patient health record that will support the sharing of patient information and care data between healthcare providers, payers, policy makers, patients, and family in a manner that addresses issues of privacy, security, authentication, and consent.

• Reduce medical and medication errors, and improve health monitoring, via the use of intelligent agents and devices. This would improve patient safety and facilitate the development of 'live' evidence-based reporting through wired and wireless platforms, devices, and applications.

• Extend the range of the delivery of care both in terms of environments and in terms of different types of users including patients. This will include home care, self-care management, tele-medicine, and Internet healthcare and information services.

• Support advanced education, training and research, and teamwork amongst health professionals and also support information exchange with patients (and their carers). This will involve evolving web technologies, virtual reality and other immersive technologies, and data mining of new population data sets.

• Generate effective shared and transparent systems for measurement and assessment of performance and clinical, administrative, and system levels.

• Lead to the generation of new health jobs including health information brokers.

A summary of the future visions on near-term developments in healthcare include: information from devices (such as pacemakers and blood glucose test kits) that enable care delivery 'anytime, anyplace, anywhere' via Internet-enabled 'live' monitoring, wireless connections, wearable devices or tags; home-based versions of General Practitioner and laboratory specimen tests that transmit results to a clinician; and clinicians supported to transmit commands remotely to activate or adjust a patient's implanted device (e.g. an implantable defibrillator or brain stimulation device).

Looking even further into the future, visions of eHealth developments include:

• **Holographic projection:** The use of life-size transparent holographic images of the human body anatomy projected into a room or onto a virtual space online for physicians to interact with as if it were a real patient.

• **Augmented reality:** Supplementing the real world by adding virtual objects so that goggle-wearing surgeons, for example, can "see through" a human body as they perform an autopsy.

• **Tele-medicine and Robotic surgeons:** Performing operations with their movements controlled by a specialist at a remote site or pre-programmed for a specific task and monitored by a physician.

• **Wetware:** Emerges as computer-implanted technology allowing direct brain access to extend intelligence, skills, and memory. Embedded intelligence becomes as natural as other types of implants e.g. persons with disabilities (PWD) support devices using natural adaptive user interfaces (NAUI) including brain electrical pulses.

While some of these perspectives appear more like science fiction than science fact, they reveal an emerging consensus on healthcare visions for the near future. Less costly and more flexible ways of service delivery might include supported self-care, moderated Internet services, and group visits. Patients would also have access rights to their own medical information.

This approach transforms the view of health information from one where it is treated as 'a tool for retrospection, a record of what happened' to one where information *is* care. By providing knowledge to patients they can become empowered and become participants in the care process. Of course, this perspective does make assumptions that patients want the information and want to take responsibility for being 'empowered', but usefully it does challenge the conventional wisdom on healthcare delivery.

Conclusion: CRC Opportunities in Patient-Centred eHealth

The Smart Internet Technology CRC has developed an innovative model for patient-centred eHealth solutions. This model expands the eHealth domain from interactions between healthcare professionals and patients, to include those between patients and devices, applications, and services that empower patients to become active participants in managing their own healthcare. The CRC's model has three dimensions: prevention, maintenance, and empowerment.

• **Prevention**: The CRC will use 'smart' technology to enhance patients' ability to be aware of and manage their personal and family health in terms of lifestyle decisions, disease prevention and medical education at home, at work, and on the move in the community. By supporting individuals to lead healthy lifestyles, to increase their medical awareness, and to reduce their risk of illness these eHealth solutions will impact on the nature of demand for healthcare services.

• **Maintenance**: The CRC will use 'smart' technology to enable patients who already have a health condition (particularly those suffering chronic disease) to manage their illness and support them living more independently at home and in the community. By supporting patients and their families to self-monitor their health conditions it is possible to avoid or reduce the necessity for hospital stays. By providing up-to-date personalised information on treatments, patients can respond directly to health events and interact effectively with health professionals.

• **Empowerment**: The CRC will use 'smart' technology to enable patients to become more active and responsible participants in decision-making regarding their treatments and care. Valid and accurate health information can support individuals and self-help groups to become empowered about the selection of treatments.

The CRC will support eHealth user needs in key areas: patients' information needs at individual and population health levels; patients' interactions/relationships with health professionals at home and in the community. It prioritises the needs of people with disabilities; the elderly, and the chronically ill (including young people).

The CRC is also conducting research, development and commercialisation programs in a number of eHealth areas. These include:

• Mobile and personalised devices, applications, and services to assist patients to:

> • Monitor existing conditions, and provide alerts and assistance to support management of these conditions. This would include capturing and processing of data from bio-sensors, intelligent clothing, implants etc., and sharing this information with patients and their carers and health professionals in conjunction with decision support tools to generate rapid care responses.

> • Support intelligent and dynamic information exchange between these devices, applications and services with existing primary and acute care health systems. This would allow remote individual patient monitoring and provision of support services.

> • Participate in health prevention and/or care management through access to timely, accurate, and personalised information. Support the education and training of patients, their carers and health professionals.

> • Generate simple point of care testing, and conduct personal health tests that enable results to be shared and interpreted by remotely located health care professionals and that support multiple consultations.

> • Manage, control, and exchange securely personal health information and authorise/ give consent to treatments etc. This opens up discussion of patient as the 'owner' of particular health data, increasingly relevant in the era of genetic technologies.

• Home-based intelligent environments to assist patients to live longer independently or supported at home by accessing services, including illness prevention, diagnosis, care, and home system management:

> • Smart 'environmental control units and home monitoring systems including proximity, fall, and intelligent appliance sensors. Particular user groups have an urgent need for interface and interaction design improvements.

• Advanced multi-modalities for supporting interaction, including speech recognition, gesture recognition, eye tracking, haptics, auditory responsiveness.

• Smart tele-medicine applications supporting 'home' doctor services including virtual healthcare accessible at home; point of care testing (e.g. mobile pathology) with evidence based decision support.

• User friendly health education and awareness services to support healthy lifestyle management, including intelligent reminders for medication or dietary intake management etc.

• Linking of homes via high speed secure networks and applications, to primary and acute care services, that support minimally intrusive patient monitoring, and/or provision of support services via audio-visual connections by carers or health professionals.

• Community-based intelligent environments and tele-medicine services:

• Advanced tele-medicine applications including virtual healthcare services delivered at one-stop community health centres where diagnosis, treatment, and prescriptions can be supported at a distance.

• Tele-care to improve patients' and carers' access to medical and other information on particular health issues, and mechanisms to support self-help groups across the community.

• Intelligent health knowledge management networks that securely support linkages amongst health professionals across the primary and acute care sectors, to deliver team care/ consultations to individual patients in remote community settings.

• Intelligent population level data mining and analysis for shaping home and community based treatments, prevention efforts, and awareness.

III. Technology

8. Open Source
Darren Sharp

Steve Ballmer, Microsoft's chief executive, recently called Linux "threat number one". Steven Milunovich, a leading analyst with Merrill Lynch, an investment bank, argues that open-source is a "disruptive technology" that could topple such industry heavyweights as Microsoft and Sun. In fact, the open-source movement is less about "world domination", which hackers often joke about, and more about an industry which, thanks to the Internet, is learning that there is value in deep co-operation as well as in hard competition.

Ludwig Siegele—The Economist, 'Out in the Open' (2001)[38]

It is unimaginable that the information society of the 21st century could be like this. And yet if abstract objects fall out of the intellectual commons and are enclosed by private owners, private, arbitrary, unchecked global power will become a part of life in the information society. A world in which seed rights, algorithms, DNA, and chemical formulas are owned by a few, a world in which information flows can be coordinated by information-media barons, might indeed be information feudalism.

Peter Drahos—'Information Feudalism in the Information Society' (1995)[39]

Critics used to dismiss the Open Source movement as little more than an idealistic crusade perpetrated by hackers bent on changing the world. Today there are few who doubt the power of Open Source to shape the Internet of tomorrow. Industry stalwarts like Microsoft continue to experience a number of setbacks amid the growing use of Open Source software like Linux, with fiscal 2005 sales expected to be down from gains of earlier years.[40] According to a 2004 Forrester Research report, nearly 50 percent of the companies surveyed were deploying Open Source applications, citing "lower acquisition costs, lower total cost of ownership and greater flexibility" as the top reasons given.[41] Open Source is changing the way companies do business, igniting legal battles over the 'information commons' and making inroads into the lucrative government software market.

A growing number of public, private, and community organisations are taking advantage of Open Source software and organisational models for cost reduction, collaborative authoring, and scalability purposes. Open Source maven Con Zymaris leads the industry body Open Source Victoria (OSV), a lobby group that proselytises the benefits of Open software to business and government. So far OSV's message has been heard loud and clear and received ringing endorsement in the form of a A$50,000 grant from the Victorian Government. OSV received the money to help strengthen its industry cluster of 80 supporting firms, which it will do by encouraging the use of Open Source through its advocacy and information referral service. OSV is targeting public sector institutions, having already held discussions with the Victorian Education Department in an attempt to undercut Microsoft's stranglehold on educational software.[42]

Con Zymaris Likens Open Source to Internet DNA
During an interview Zymaris explained how Open Source is foundational to the Internet's ongoing development:

> The Internet wouldn't exist without Open Source. The TCP/IP protocol that the US Department of Defense funded was all done on what we now call an Open Source basis. For example, here's a protocol, here's how it works, it's free to use now anyone can implement it. The whole Open Source movement totally dovetailed with the development of the Internet like genetic strands. You can't have one without the other; so no Open Source, no Internet.[43]

The economic benefits of Open Source are providing both public and private sector organisations with the means to cut IT spending costs. In 2003-2004 Telstra trialled Linux-based software as an alternative to the Windows operating environment in an attempt to

halve its A\$1.5bn technology budget.[44] Recognising the potential threat, the software giant came to the party in a deal that saved Telstra millions, highlighting the extent to which Open Source is forcing Microsoft to discount large contracts. Open Source has even infiltrated that bastion of bureaucracies, the Australian Tax Office, which is in the process of developing an Open Source software policy. A positive report on Open Source software (OSS) prepared for the ATO by the Gartner Group suggested the "ATO develop a policy not only for the use of Open Source software, but a policy that would allow it to take advantage of the OSS development as a means of reducing costs."[45]

Firefox: Browser Wars 2.0

The Firefox browser developed by the non-profit Mozilla Foundation is at the forefront of an all out assault against proprietary software. The vulnerability of Microsoft's Internet Explorer browser to desktop hijacks, spyware and other malicious attacks has seen users abandon the market leader in droves. Firefox is the product of countless hours of unpaid work by the global Open Source developer community. It has already attracted close to 50 million downloads, and at April 2005 held nearly 7 percent of browser market share.[46] The software is easily customisable and has a scaled down interface to appeal to the widest possible user base. Microsoft has responded by announcing the imminent release of Internet Explorer 7 with enhanced security and privacy features. The world's willingness to embrace Firefox is clear indication that Open Source applications, once considered purely the realm of hobbyists, has appeal to a much wider audience than previously considered.

The Battle of Ideas

Like all great tales of technological achievement, the Internet's genesis is a human story, an epic narrative populated by heroes and villains in a struggle defined by greed, failure, triumph, and the quest for freedom. The Internet's birth and ongoing development is grounded in a set of cultural struggles that provide a useful context through which to view possible Internet futures. This struggle comprises a power dynamic between competing world-views that differ markedly over how to define the Internet's operating protocols, architecture, and governance.

This ideological battleground has been fuelled by the economic tensions over Proprietary vs. Open Source systems, along with political arguments over the merits of competitive vs. cooperative forms of social behaviour. Those in favour of a strong Intellectual Property (IP) regime often view Internet regulation through the lens of bureaucratic command-and-control like management. These proponents often adopt the language of free market economics, to prevent what they see as a descent into piracy and chaos. The Open Source position tends to view the Internet as an emergent, grass-roots phenomenon that requires an open model of

cooperation in order to foster innovation. These distinct orientations lead to quite different approaches about how the Internet's future 'operating environment' should be defined. Demystifying the 'archetypal patterns' that form the basis of these value systems requires an understanding of the Internet's cultural structure.

Manuel Castells, sociologist at University of California Berkeley, lays down a substantive framework to achieve this in *The Internet Galaxy* (2001), declaring the Internet asserts its own distinct culture or "set of values and beliefs informing behavior".[47] If there is such a thing as an identifiable Internet culture, it is a culture constituted by human actors - producers, consumers, and users - whose collective practices brought the Internet into existence and will continue to shape its evolution towards 2010.

According to Castells, the culture of the Internet can be broken down into a four-layer structure: the techno-meritocratic culture, the hacker culture, the virtual communitarian culture, and the entrepreneurial culture.[48] All four levels of structure are indispensable and interdependent. Yet the Internet's success is fundamentally determined by the degree to which the hacker community has access to and the freedom to manipulate the source code. Castells articulates how Open Source software is the culturally determined, key technological feature in the Internet's development:

> The key connection is the openness and free modification of Internet software, and particularly of the source code of software. Open distribution of the source codes allows anyone to modify the code and to develop new programs and applications, in an upward spiral of technological innovation, based on cooperation and the free circulation of technical knowledge.[49]

Pekka Himanen's seminal text *The Hacker Ethic* (2001) makes a clear distinction between *hackers*, a community of programmers that freely exchange code for the common good, and *crackers*, their illegal security-busting cousins. The most high profile hackers include Free Software activist Richard Stallman, creator of the GNU project (GNU is a recursive acronym for Gnu's Not Unix), and the Linux renegade Linus Torvalds, the namesake behind the Linux operating system. Revealing the logic behind the development of these Unix-compatible systems provides pathways for understanding the significance of the 'Free Software' and 'Open Source software' movements.

In his 'GNU Manifesto' Stallman is at pains to point out the difference between "free" in the sense of freedom and "free" in the sense of price.[50] This distinction led many companies to reject Free Software and distance themselves from Stallman's dogged determination to defend his ideals.[51] The ideological nature of Stallman's Free Software Foundation (FSF) led Eric S. Raymond, author of *The Cathedral and the Bazaar* (1999) to form the Open Source Initiative (OSI) in 1998 as a means of presenting a more 'business friendly' licencing model to the corporate world.[52] This sparked criticism from Free Software advocates fearing such a development would distance Open Source from Stallman's original vision. Yet both the Free Software GPL and other Open Source licences can be used for proprietary purposes depending on the circumstances.

Richard Stallman's Vision for Free Software
During an interview Stallman explained the subtle distinctions between the Free Software and splinter Open Source Movements:

> The Free Software Movement's position is that software users morally deserve, and should always have, the freedom to change and redistribute what they use. The Open Source philosophy argues for free software practices based on practical values alone, saying that allowing many people to cooperate in developing the software leads to better quality software. It does not say that the freedom to cooperate is important as a matter of principle, as we do.[53]

The Free Software and Open Source movements converge over a belief in the power of collaboration to get the job done. As Stallman argues, it makes far more sense to harness the collective energy of a community of programmers in order to avoid "wasteful duplication" and encourage efforts aimed at "advancing the state of the art."[54] The antinomy between this libertarian hacker culture and the entrepreneurial culture epitomised by Microsoft and others has been the site of many turf wars in the struggle to define the limits of the Internet and the boundaries of acceptable behaviour.

> **A Tale of Two Architectures**
>
> The original peer-to-peer architecture of the Internet is a consequence of the end-to-end design principle that forms the basis of the Internet Protocol (IP). This structure has enabled the network to remain relatively simple, and in Lessig's terms, created a "platform for innovation." As the Internet moved to its commercial phase in the mid 1990s, a client/server architecture began to gain dominance. This model mirrored the one-to-many paradigm of broadcast television through its 'downstream' approach to data traffic, in contrast with P2Ps upstream/downstream model.[55] In order to illustrate the divergent social effects engendered by open or closed software architectures, the story behind the Linux operating system provides an illuminating case in point.
>
> Eric S. Raymond's influential *The Cathedral and the Bazaar* (1999) contrasts the software development styles of the "cathedral" model of the commercial world versus the "bazaar" model of Linux. The development of the Linux operating system has attained almost mythological status and is often cited as testament to the power of Open Source peer-to-peer development. Raymond's core argument is that "given enough eyeballs, all bugs are shallow" which he terms "Linus' Law."[56] Created by Finnish university student Linus Torvalds, in conjunction with thousands of keen co-developers, the Linux system laid the groundwork for future Open Source projects. As Raymond writes, "Linus' cleverest and most consequential hack was not the construction of the Linux kernel itself, but rather his invention of the Linux development model."[57]
>
> Linus developed a new language for software creation by utilising the collective intelligence of his users through an Open Source strategy of harnessing the power of peer-to-peer networking that Raymond characterises as the "bazaar" model. In contrast the "cathedral" model of proprietary software typically involves a privileged group of developers working in isolation, never releasing the source code to the public.

The Price of Culture

Several important changes to the regulation of information through electronic networks have taken place in the last decade as a consequence of economic globalisation. Foremost among these was the World Trade Organisation agreement on Trade-Related aspects of Intellectual Property Rights (TRIPS), whose provisions obligate member countries such as Australia to enforce an arbitrary level of IP protection. The US corporate sector lobbied for these reforms in order to implement a stronger regime of IP rights linked to trade policy. TRIPS has come under intense criticism from academics like Vandana Shiva for its asymmetrical treatment of developing countries over issues related to the cost of life-saving medicines and the patenting of seeds. Supporters of Open Source view TRIPS as a barrier to innovation by preventing users from modifying the technology, leading to an IP regime that Australian National University scholar Peter Drahos equates with "information feudalism."[58]

Central to these debates is how to manage the 'commons', a concept rooted in the 18th Century enclosure movement of rural England when communally managed public land became private property through Acts of Parliament. Advocates of Open Source see the current struggle over an 'information commons' as a second enclosure movement as they fight to keep the Internet space a shared public resource. Meanwhile media corporations, publishers, and owners of proprietary software defend themselves against what they see as theft of their Intellectual Property in order to protect their return on investment.

Media scholar Siva Vaidhyanathan in his book *The Anarchist in the Library* (2004) characterises the battle for the commons as an age-old struggle between contending forces of anarchy and oligarchy.[59] As our information systems become more complex argues Vaidhyanathan, the dynamic between 'hackers' (anarchists trying to pry open the system), and big business and government (oligarchs that have an interest in making information scarce) is driven to ever increasing extremes of attack and counter-attack.

Into this milieu enter Lawrence Lessig, Professor of Law at Stanford University. Lessig has built a formidable reputation as an Intellectual Property expert, a strong advocate of Open Source development, and the most vocal critic of the current US copyright regime. Lessig paints a compelling picture of the future confronting global society if commercial interests are given free reign to enclose the information commons backed by the full power of the law.

Lessig has absorbed the insights from the Free and Open Source Movements and widened the IP parameters beyond software, to encompass music sampling, book publishing, and even scientific research. He mounts a strong set of arguments against the invocation of copyright law and punitive legislation that restrict public access to cultural resources that he believes should remain public domain.

Lessig and his supporters established the 'Creative Commons' initiative (www.creativecomons.org), the focal point of a new licencing framework that broadens creative boundaries for producers, artists, and authors. Creative Commons licences provide protection within the framework of domestic copyright legislation but add new provisions to meet the demands of today's creative industries. Creative Commons has become a global movement in its own right. The most famous cases of creative works using Creative Commons licenses include author Cory Doctorow's science-fiction books and the music of Brazilian Minister of Culture, Gilberto Gil.[60]

Closer to home, Professor Brian Fitzgerald, Head of Law at Queensland University of Technology, leads the small team charged with the task of porting the Creative Commons licence to Australia. This process was completed in January 2005 and adds Australia to a growing list of countries forging a reformed IP agenda. During an interview Fitzgerald outlined how current legal disputes over filesharing highlight the necessity to balance the need for economic reward with freedom of expression: "The big argument at the moment with file sharing software is that copyright owners are saying: 'We want to protect our copyright material and what you're doing is unlawful.' The user side of the argument is that 'this is innovative technology and what you're doing is using copyright or IP law to stifle innovation.' So on one side you want to stop copyright infringement but the collateral damage here is going to be innovative technology."[61]

These very arguments are taking place around the world in real-time, with judges acting as de facto policeman for the media and entertainment industries. The recent shutdown of sites linked to content using the p2p client BitTorrent at the behest of the Motion Picture Association of America (MPAA,) is reminiscent of the treatment meted out to Napster. At the start of 2005 record company lawyers were attempting to have the p2p application Kazaa held liable for breach of copyright in the Australian Federal Court. This strikes Fitzgerald as an inappropriate way to deal with copyright infringement: "The analogy is that if a gun manufacturer sells a gun and someone shoots someone, should they be liable for the unlawful act that has occurred with the item which could lawfully be used but has in this instance been unlawfully used? Should the people who make the technology carry all of the blame in this instance? That's something the courts will have to grapple with in the confines of copyright law."[62]

The 2004 Australia-United States Free Trade Agreement (AUSFTA) harmonises Australian legislation with the world's strongest Intellectual Property regime. These changes have been vehemently rejected by Australia's creative industries and consumer groups for imposing harsh penalties on the fair modification of copyrighted content, devices, and applications. The Australian Government's copyright agenda involves the incorporation of contentious reforms including the extension of copyright duration, the criminalisation of copyright infringement, and the anti-circumvention provisions of the Digital Millennium Copyright Act.[63] This situation is further exacerbated in Australia by the lack of any fair use provisions similar to those protected under United States legislation.

Open Commons champions caution against legislation that gives market forces the power to fully enclose the commons, which they argue is neither inevitable nor good for business. From a libertarian perspective, the ability to legislate Internet architectures that blindly protect Intellectual Property but forsake the free exchange of ideas has the effect of restricting legitimate research and critique.

Such architectures of control also stifle economic prosperity by preventing artists, entrepreneurs, and other creative risk-takers from drinking at the well of collective human culture built up over centuries. Lessig cites Walt Disney's adaptation of the Brothers Grimm stable of fairytales, such as Snow White and Cinderella, as expressions of the sort of adaptive creativity to be celebrated. Disney was able to swim freely in an Open Commons, to borrow characters and storylines from elsewhere, reinterpret them and create new art forms that continue to thrill generations of audiences. As Lessig writes, "Disney ripped creativity from the culture around him, mixed that creativity with his own extraordinary talent, and then burned that mix into the soul of his culture. Rip, mix, and burn."[64]

Does an Open Commons Foster Innovation?
Brian Fitzgerald discusses the importance of the Creative Commons licencing model:

> Creative commons is not anti-copyright or anti-money-making but tries to create a resource of information that can be accessed in a free manner without fear of prosecution. The Creative Commons project in part is about making sure there's stuff out there that we can share, for lawful reasons as well as social reasons. I think it's terribly important for society generally and I think it can have a real benefit also for creativity in the corporate sector. Creative Commons builds on the Free and Open Source Software movements. Creative Commons works by claiming IP right at the source, which is either copyright in software code or copyright in content, and asks people downstream to use it in an open manner. If we simply gave it away there's no guarantee that a corporate couldn't come along and propertise it, use it in some sort of product and close it off downstream. Creative Commons ensures that once the work leaves the creator's hands it stays open forever. That's the notion that Richard Stallman called Copyleft, which is the idea that you are obligated if you use this material and further innovate and distribute upon it, to actually share back to the common good.[65]

Technological innovation arises out of experimentation and modification, yet the recent Australia-US Free Trade Agreement (AUSFTA) does not bode well for creative producers or end-users towards 2010. Roger Clarke in commenting on the recent FTA has written that: "Innovation is seldom achieved by one organisation making a massive

breakthrough, but by many organisations and a great deal of ongoing interaction. Rather than 'one person standing on the shoulders of giants', most progress is achieved by hordes of busy elves."[66] Extension of copyright terms and anti-circumvention legislation exposes creative risk-takers to a greater degree of criminal offences. The architecture of the Australian Internet mandated through the AUSFTA, locks down the information commons and a number of possible futures along with it.

Terry Flew on the Market Benefits of Creative Commons
During an interview Dr Terry Flew (QUT) outlined why projects like Creative Commons are vital for economic and political freedom:

> I think it's been very important that Open Source has been aligned to Creative Commons and one of the reasons for that is the sections of the legal community that have caught on to this are extremely politically savvy. So it's not coming from the fringes, it's coming from people at Harvard and Yale. It's absolutely in the mainstream of legal debate and part of that is that proprietary licenses not only potentially disadvantage consumers but also potentially disadvantage other industry players. So there's an argument here that Open Source and Creative Commons are actually about making markets and capitalism work better in an Adam Smithian sense of the dangers of the monopoly provider extracting rents on the basis of things other than its competitive advantage. So we'll either continue to get this interaction between big software and its allies in the copyright industries, in dynamic tension with those operating in opposition to these tendencies. Or we get some kind of a breakthrough of a more Open Source/Creative Commons type model, some re-thinking of copyright regimes which would derive from a coalition that would include business and consumer interests and their getting some kind of leverage in the political process.[67]

Commons-based Peer Production

The Free and Open Source movements emerged from the hacker culture of earlier programmer communities. More recently Do-It-Yourself (DIY) media technologies have given anyone with access the ability to become a producer. This has spawned an entirely new understanding of authorship and content production in film, games, software, television, and music. Add deconstruction, new media literacy, and social networks to the mix, and within three decades from the VCR to podcasting, a new media ecosystem was born. As the Internet becomes the platform for a range of everyday practices, issues like file sharing, device tethering, mod chips, and mash-ups take centre stage for millions of users around the world.

When DJ Danger Mouse (a.k.a. Brian Burton) mixed rapper Jay-Z's *Black Album*, with the Beatles *White Album*, to make the *Grey Album*, he gained global acclaim along with a cease-and-desist order from EMI. Under the provisions of the US Digital Millennium Copyright Act such mash-ups are illegal, and supporting stores and websites were ordered to stop selling the album. Despite these setbacks the *Grey Album* has been widely downloaded (http://www.illegal-art.org/audio/grey.html) and received critical praise, with Entertainment Weekly naming it the "#1 Album of the Year" for 2004.[68] The fallout over the *Grey Album* sheds light on the creative challenges facing artists wanting access to an information commons constrained by an IP regime that exclusively favours copyright owners.

Doctorow: "In Order To Make Great Art You've Got To Steal"
Cory Doctorow is the European Outreach Coordinator for the cyber liberties Lobby group, The Electronic Frontier Foundation (www.eff.org). During an interview Doctorow explained why creativity requires an Open Commons:

> There are all kinds of interesting art that's [sic] made by recombining other kinds of art. When I put on my creative hat, the thing that I need in order to create is a kind of rich humus in which my own ideas can grow. That soil consists of all the other ideas. I need to be able to rip people off the same way that people before me ripped off the people that came before them and make new stuff. In order to make great art you've got to steal. You've got to take others' ideas and recombine them.[69]

The flowering of Open Source software, DIY media, and 'remix culture', is no fringe activity performed on the margins of society. These developments are part of a much broader social trend that Charles Leadbeater and Paul Miller have dubbed the *Pro-Am Revolution* in a report for UK think-tank DEMOS. The report defines Pro-Ams (professional-amateurs) as "innovative, committed and networked amateurs working to professional standards."[70] These enthusiasts are a result of demographic shifts that have given many in the West increased time for 'serious leisure' activities that include everything from Linux programming to fan-based production in computer games like *The Sims*. Pro-Am groups are also known to employ Open Source organisational models of knowledge transfer between expert and novice members.

Yochai Benkler, Professor of Law at Yale University has explored the socio-economic transformations wrought by these set of changes which he describes as 'commons-based peer production'. According to Benkler, the emergence of self-organising, grass-roots projects like Linux is leading to a "third mode of production in digitally networked environments."[71] Examples of this new form of production abound throughout the Internet. Projects like the

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peer-reviewed Wikipedia (www.wikipedia.org) have attracted thousands of online 'Pro-Ams' keen to share their knowledge of every topic imaginable.

Writer Julian Dibbell has documented the trials and tribulations of the players that inhabit the networked role-playing game *Ultima Online*. These 'fan-based production' communities buy, sell and trade virtual goods like weaponry, houses, armour and magical powers that exist in the game only. One man reportedly paid US$750 on eBay for a house produced by a fellow gamer.[72] Such trends are only set to intensify towards 2010 as the information commons expands to encompass more aspects of daily life in all its forms.

David Rooney from the University of Queensland would like to see the development of a parallel creative economy that gives grass-roots producers an opportunity to share their work with a wider audience. Rooney is part of a team that won an ARC grant to build ACRO (Australian Creative Resources Online), a searchable Internet database with 10 terabytes of server space.[73] Users can search the archive and preview audio, video, or stills, and can download the selected resource. The service provides basic information about the copyright attached to the work through Creative Commons licences to see what rights have been reserved. Most of the material is on an attribution licence and is provided on an open resource basis.

ACRO represents merely one of at least several thousand 'communities of practice' around the world embracing 'open access' resource models. In the educational sphere, MIT's OpenCourseWare (http://ocw.mit.edu/) initiative allows free Internet access to a large cross-section of course materials. In the world of academic journals, 'open publishing' has spawned a renaissance in peer-reviewed scholarly research. The BBC became the first major broadcaster to release free digital content through its Creative Archive to British tax-payers. Independent film-maker Robert Greenwald made the interviews from his documentary *Outfoxed* (2004) available through the Internet under a Creative Commons licence.

These developments reflect a shared commitment to the Open Source values of collaboration and knowledge transfer. Colin Steele from the National Scholarly Communications Forum (NSCF) has argued that "prosperity in a knowledge economy depends as much, if not more, on knowledge distribution power than it does on knowledge production power."[75] Creative Commons has moved Open Source beyond software to provide opportunities for innovation and prosperity wherever the Internet can be utilised as a distribution platform. Many stakeholders are embracing the benefits of Open Source as others seek to destroy it through stifling legal and economic mechanisms. New uses for open technologies and systems are being developed everyday and these battles will continue to be fought towards 2010.

9. Voice Is Hear
Mandy Salomon

Three years ago, 80% of call centre transactions were handled by people. Now it's less than 50%. Automated technology solutions, including interactive voice response, email, Internet, and speech recognition have all grown at the expense of costly human agents.

Martin Conboy—AFR, 'Call centres.net' (2005)[76]

In the future, devices that speak and listen will be everywhere: light switches, window shades, kitchen appliances, TV remote controls, lamps, wrist watches, eye glasses, monuments, grave stones (perhaps a little spooky) and devices I can't yet even imagine. This will enable people to talk and listen to almost any device.

James A. Larson—Manager of Advanced Human Input/Output, Intel Corporation (2004)[77]

It is worth pausing for a moment to contemplate the incalculable babble in cyberspace: millions of individuals 'talking' to one another in real time on the web; multi-millions using email for their business or family dealings; spam-bots posing as spurious cyber-persons with much to say. There is plenty of talk out there. It is just that in cyberspace, no one can hear you scream.

Until now: Voice is on the move. Humans communicate using speech, gesture, and body motion, yet until now, computers have not used this valuable information. Instead, computers have forced users to sit at a typewriter keyboard, and stare at a TV-like display. When glitches occur, the user must embark on fruitless searches though labyrinthine knowledge bases - often leading to frustration, inefficiencies, and disuse. Imagine if next time our system crashed, we could ask our electronic friend what was wrong, and it could tell us.

But let us take the futures scenario a step further. What if there were no perceptible 'system' to crash, and the era of the 'devices', shock horror, had disappeared? Instead we would move through intelligent environments in which every surface, every object was integrated with one another. It would be a world in which artificial knowledge systems imperceptibly follow us everywhere, interpreting gestures, our body attitude, our eye gazes, and the things we say: then responding to our needs and preferences by interacting with personal servers (these might be chips carried in our clothing or embedded in our skin).

This vision is no longer limited to the realm of the computer laboratory. Already we have the means to tag objects with smart sensors known as radio frequency identification (RFID), a super-sophisticated bar code, which can relay information about itself to other objects and information systems.[78]

The role that voice plays in the 'technology futures' landscape really depends on how people envisage their world. If it is a world revolving around the hands-free operability of a mobile phone with its plethora of add-ons, then voice interfaces are going to play a very big part. If the 'ubiquitous' or 'pervasive' computing paradigm emerges, then voice will be just one of a whole range of modalities at our disposal.

By 2010 both scenarios may well co-exist, along with all kinds of other technology, old and new, (some regions of the world will be ecstatic just to have to electricity). But whatever the application, voice technologies will be required, and to this end it is necessarily evolving rapidly.

Is Speech the Inevitable Interface?

Speech was the first communication technology that enabled humans to transpose their ideas from the immediate action and response of body language - such as the raised fist of our cave dwelling forebears - to an idea disassociated form the physical act itself. Voice gave us "the power to act without reacting."[79]

The push for a greater human focus in technology, summed up by Donald Norman's maxim, "the future world of computing, is one in which the users needs' are paramount",[80] is driving research into more natural ways of interacting with computers. Speech has the box seat. By going back to basics and understanding the way people are, technology is moving forward.

Let us start by looking at the complexity of human language. Talking is the product of different control systems that constitute us. On the cognitive side, we have learned to control and modulate the sounds that humans emit, and thus created a vast set of audio rules from which we have created language.[81] Physiologically, talking is a series of vocal patterns. These can be plotted and articulated as programmable data, as we can see in the current crop of dictation software. Socially, talk is a matrix of elaborate meaning, developed and mutated over time, constrained by and developed as a response to the rules and conventions of a culture.[82] Embedded in language is a secondary layer or *paralanguage*, which textures information through tone, pitch, pace, rhythm, and volume.[83] These features, as much as the words themselves, convey emotion and attitude. Is it any wonder that replicating speech in all its complexity has been an elusive goal for the true believers in the search for a natural language interface?

Speech: Inevitably, Problems

As humans get cleverer at modelling computers on themselves, so speech plays an inevitable part in new forms of interaction with technology. But speech is a difficult thing for computers to understand. Computer language is fixed and solidly defined, whilst natural language is soft and evolving. They do not fit well together. The challenge to develop trouble-free human-computer grammars has been an ongoing problem. Replicating orality is not an easy task

Consider the linguistic joke: "Why is a moth flying around a candle like a gate in a gale" Answer: "If it keeps on, it singes its wings." ("If it keeps on its hinges, it swings"). Another favourite, frequently cited by speech researchers is "Did you say 'How to recognize speech?' or 'How to wreck a nice beach?'" [84]

Acoustic ambiguity is one of the hurdles faced in the application of voice commands. This is where speech agency and voice control systems have come unstuck. Computers are able to replicate language, but are not (yet) able to think like a human being.

However, assisted by the insights of Moore's Law, the puzzle is beginning to unravel.
In order to understand the meaning of conversational language which is often incomplete and grammatically incorrect, a computer has to have the ability to learn. As designers come to understand more about encoding human experience and converting it into programmable data, our smart assistants will get to know us, deducing from our previous actions what we will probably want to do next time. Personal computers will become *intensely* personal, to the degree that they will take on our "informational personalities."[85] They will get to know our preferences and be able to contextualise from our environment.[86] Computers will register that commands made in a car are likely to differ from commands made in the kitchen and will deduce that the oil level about which we ask is petroleum, not extra-virgin. It will then vocally navigate us to the nearest petrol station rather than the cheapest (it knows we prefer convenience over the saving of a dollar). And as it is network-connected to the tagged products in our fridge, it will remind us that we need to buy milk for the morning.

Cognitive developments in computer programming are integral to the thrust of next-wave computing: the move towards an intuitive, invisible, pervasive system, one that is not constrained by the physical hardware we have been used to. Mobile communication devices highlight the need for accessing the web in new ways rather than via the keyboard. In the information society where there is no keyboard, text based commands will no longer be practical. Computers will simply have to know how to process natural language systems.

A Historical Overview of Voice Technologies

The 'voice technologies' of tomorrow have not been developed in isolation. They are a part of a continuum in computing's short, albeit dense, history.

1980s

The evolution of computerised voice technologies began with voice assisted services for the visually impaired, notably Kurzweil's Reading Machine (1976). This machine combined two technological breakthrough technologies: Text to Speech (TTS) and Intelligent Character Recognition (ICR). Speech Recognition (SR) technology came some 10 years later with Kurzweil's large vocabulary machine becoming commercially available in 1989. These dictation tools began to make inroads as business applications. People with mobility problems also benefited from technology that now did not require the manipulation of the keyboard for the input of data. The teething problems of this new technology included inaccuracy and an inability to differentiate between voice and other sounds, hindered widespread uptake.

1990s

The rise of the Call Centre, with its '24/7' customer service ethos created a dynamic new environment for speech applications. Businesses with large client bases such as the energy, banking, flight and telecommunications industries enthusiastically jumped aboard. The predominant voice application was Interactive Voice Response (IVR), in which a pre-recorded voice listed a menu of options and prompted the caller to respond using the phone keypad. The system was limited to handling closed-system enquiries, such as yes/no responses, account balances, payment dates, and timetables. The set-up and implementation costs were offset by measurable economic benefits; companies had more though-put, greater satisfaction from customers, and a reduced bottom line. Concomitantly, automated call handling set a wider social agenda: customers were becoming acclimatised to the idea that computerised systems rather than people were the deliverers of information.

2000s

Companies' motivation to gain the competitive edge spear-headed intensive research into a more sophisticated speech technology: natural language speech recognition (NLSR). Developers have always held the belief that the more natural the interaction with computers, the more comfortable we are using them, and indeed it has proved to be the case with NLSR. Customers report a preference for talking directly with the

'persona' on the end of the phone. They feel they being 'heard', are more in control of the exchange and are able to direct the query themselves rather than accepting the pre-determined path set for them.[87] Many users of NLSR systems choose to say goodbye before they hang up, demonstrating the verisimilitude of the exchange.

Central to NSLR development is the greater processing power of computers and a better understanding of the complex patterns, grammars, and tonalities of language as programmable data. As more and more companies turn to and NSLR, IVR looks to become the orphan child of call centre technology.

Human Language Interaction: The Next Phase

James A. Larson, Manager of Advanced Human Input/Output at Intel Corporation, Co-chair of the W3C Voice Browser Working Group, was interviewed in August 2004 about his vision for the future:

> I see two trends: (1) devices getting smaller and smaller, and (2) devices communicating with one another. If a device is so small that it cannot contain a speech recognition system (so it can hear) and a speech synthesis system (so it can speak), these functions can be offloaded to other devices to which it is connected. In the future, devices that speak and listen will be everywhere: light switches, window shades, kitchen appliances, TV remote controls, lamps, wrist watches, eye glasses, monuments, grave stones (perhaps a little spooky) and devices I can't yet even imagine. This will enable people to talk and listen to almost any device. I understand that some scientists are working on micro devices that can be embedded in "paint" which can be spread on surfaces. Folks often ask me when this will happen. My response is "sooner than I think."[88]

In Larson's vision of a networked environment, human language systems will play an integral part. Speech applications will be embedded in objects around us. Voice will be used as a control/command system in our smart homes. People will verbally request information from the web while they are on the move, and it will be read back to them. But issuing commands and retrieving information will be only part of the way we will use the web. A new era of the Internet is upon us.

The Elusive 'Killer App'…What Is It? When Will We Get It? How Will We Use It?

Human Language Interaction (HLI) will come into its own as we progress down the path of mobile computing. A Portable Digital Assistant (PDA) with a miniature keyboard is not a

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satisfactory replacement for a laptop, being ergonomically awkward for anything but the most rudimentary commands. Portable computing demands that the user interface is separated from the computing device. If the computer is carried somewhere on the body and activated using the hands-free/eye-free control systems such as the voice, then the user can go anywhere with it. Headphones and microphone headsets would provide the link. Already these are being worn by some early adopters of PDA/mobile phone hybrids (smart phones).[89]

The computer of the future will be a kind of personal server. James Larson thinks this server will be the size of a pack of cards.[90] It will have a multi-functional personalised speech application which could perform the tasks of today's more rudimentary speech software, but in real time, and in any environment. This all-in-one process would provide users with an enormous range of command and control opportunities, including a voice browser to the World Wide Web. The options would be far greater than anything afforded by an old fashioned keyboard. Users might tell the oven to turn the dinner as we leave work. Users would speak numbers into our phones rather than dial them. Users could send spoken SMS messages and emails; record spoken words and phrases for later replay – for example, a 'to do' list. Users would register our voiceprint to enable us to enter secure sites to purchasing goods. Users would use it to identify others, particularly useful if we had an e-tail business. Users could do their correspondence and file reports while they were sitting in traffic. Our dictation would be converted instantly into text and read back to us. Users could interrupt at any time and make corrections. When it suited, we would ask it to 'send'. Wherever users were, they could tell our computer to save, or print.

According to Pattie Maes, principal investigator of MIT Media Lab's Ambient Intelligence Group: "Agents are a new way of thinking about software that is more proactive. Sometimes I envision an agent as having extra eyes, hands, or brains which are looking out for my interests."[91] Pattie Maes has pioneered the Software Agents field: software programs called 'bots' that users configure to scout the Internet, organise information and manage complexity. Her bots can autonomously roam the Web, evolve and program themselves due to Maes' knowledge of artificial life and complex adaptive systems. Maes distinguishes her research from technology-reliant Artificial Intelligence as Intelligence Augmentation (IA) that enhances a user's capabilities. For Maes, software agents will define the Internet 2010, in which bots conduct negotiations on behalf of users, and by identifying new patterns in data, prevent information overload.

Many researchers envisage a world of semi-autonomous agents which would perform specified tasks for us, much like a personal assistant. They might trawl through documents on our behalf, or search the Internet looking for the best deal. With our personal voice application, they too would be voice enabled (via speech synthesis), programmed to converse with us by converting text into natural sounding human language, and able to access a database of facts that would help them to make sense of our language.[92]

Word building information (grammars) would be sourced from a voice database accessed from a voice specific server. Mike McCue from TellMe, a pioneer start-up company in voice-application networks, describes such providers as an amalgamation of a telco–style service provider, a software firm, and a recording studio. As more applications are built for clients, the providers would 'data-mine', as a means to build up their own central database of words, place names, and language use. This knowledge base would be available to all its subscribers, providing them with the library from which their personal conversational agents would draw.[93]

Mobile Communications

Mobile phone technology has been a disruptive force in computing, impacting on the evolution of speech technology. Global uptake and innovation in mobile communications has seen the convergence of several applications including email, SMS and MMS, MP3 Player, data storage and web browsing in one device. Commonly referred to as Personal Digital Assistants (PDAs), these devices are simply too small to make data entries via a mouse and keyboard practical. The bid to find new and better ways of 'actioning' commands has led to a surge in the development of other modalities. Foremost amongst these is voice.

Traditionally computer language has been seen as being fundamentally different to human language and this has limited progress in the field of conversational agents. However, speech technology is evolving rapidly as processing power increases and the digital mapping of human language is better understood. The recent research at MIT's Media Lab has explored speech recognition based on an understanding of ideas rather than the deciphering of sounds. [94] Another study examined the feasibility of talking directly to a computer in order to program it, with dialogue between the computer and programmer to clarify the muddy bits.[95]

Mobile communication devices highlight the need for accessing the web in new ways rather than keyboard. Voice-enabled web browsing holds great promise in an era of mobile

computing. Personal servers will store the necessary databases for speech applications. Our PDAs will communicate with the server, using short-range wireless links.[96]

Voice technology is being driven by standards coming from the W3C. Voice recognition technology will benefit users when applications start communicating with each other in a straightforward way. Currently incompatibility and inoperability between systems is clogging the flow of information and making niche add-ons expensive and of limited value. **Developers are being urged to forgo proprietary concerns** over Intellectual Property in favour of exchanging software architecture. By creating an Open Source (OS) for new platforms and applications, voice technology aims to be universal rather than product-specific.

The Web is soon to get a lot smarter through the use of metadata (the Semantic Web) which will treat the World Wide Web as one giant database that links human readable documents and machine readable data in a way useful to both humankind and machine. In 2005 computers can show us data, however computers cannot not make sense of, or respond to, the data. With the Semantic Web, an intricate system of tagging will enable our smart personal agents to source and retrieve information for us. Voice technologies could be used to drive adoption of the Semantic Web.

Voice will be one of several modalities from which we will chose to interact with intelligent environments, according to time, place, convenience, and whim. The more modalities we have at our disposal, the more information we will impart to our computers and the more they will be able to understand us and our needs.

Many new voice applications are coming onto the market.

Reasons for requiring new applications may be:[97]

- The need for call centres to reduce costs while improving customer service
- The extension of Web services to the telephone
- The need to reduce the cost and delay in transcribing medical reports and speed up billing?
- Disabilities that make using a keyboard or screen difficult
- Working out how all the new features in the smart phone you manufacture can be easier to use
- An automobile is being built with features which require a hands free facility

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- A telephone service provider needs to create services that retain customers or generate additional revenues.

- The need to monitor calls in a call centre for business intelligence

- The cost and damage to a company image through fraud underlines the need for a voice biometric that works over the telephone

- A distribution centre needs a more efficient way for workers, whose eyes and hands are occupied, to pick merchandise for an order.

- The expanded range of business opportunities made possible by introducing a voice user interface in over-the-telephone services.

Real life customer service agents versus electronic personas. Ironically, the user-based modelling that has brought about innovation in the voice and speech technologies is likely to shrink employment in the call centre industry over time. Today, with the growth in the customer service industry, training and retaining staff is seen as a continual problem. Offshore call centre agents do not necessarily represent a solution to the brain-drain. The political and environmental instability of Southeast Asian countries where much of the work is outsourced, along with conflicting industrial and work place practices, means that Australian companies are electing to use voice recognition and speech synthesis in preference. A computer with a voice interface which seamlessly handles our enquiries, can field all our questions, and even tailor its language to fit with the way we talk. Adaptive voice systems will be a new form of tough competition.

How smart will our agents get?

Can smart agents be hijacked by hackers, especially when they search systems outside of our own knowledge systems? What levels of security will be needed to ensure that our personal information is kept private? Will information ever be discreet again? As we off-load many memory-based, and logic tasks to our assistants, will we lose our capacity to be flexible, to multi-task, to remember? The intricate workings of the Web that lie ahead might lead to a different kind of society - possibly, a different kind of humanity… Internet luminaries Bill Joy (former chief scientist Sun Microsystems and creator of Java) and Jaron Lanier (Virtual Reality pioneer), are amongst high profile technologists who canvass the dystopian view. However, the intelligent agent research community is refusing to slow down in order to consider the societal implications. We have every reason to assume that a world in which the walls talk and computers program themselves according to our spoken wishes will come to pass. By 2010 we will have a firmer view of when that will be, and it may be sooner than we think.

IV. Society

10. Digital Games
Alex Burns

I'm very aware of the collaborations that are initiated as the result of people meeting, and the ripple effects of that. It's a cultural space. Opening up possibilities, platforms and frameworks to people that weren't there before. More concrete opportunities will develop. Fiercely independent game developers will feel more confident about what they want to do and now have the skills to do it. Hopefully industry and government will recognise the talent and potential of independent developers and change what they do to respond to that. I expect both of these things will happen in an incremental sense.

Marcus Westbury—NextWave Festival director; FreePlay co-founder (2004)[98]

Because people work on multiple projects we get to explore a wide range of ideas compared with other companies where I took it for granted that projects took 18 to 24 months to create. GameLab investigates new forms of play, new kinds of content, new kinds of partnerships with different companies, new ways of learning through games, and new ways of telling stories with games.

Eric Zimmerman—GameLab co-founder (2004)[99]

Global Industry Outlook

PricewaterhouseCoopers forecasts that global revenues for the Entertainment Economy "will increase from US$1.2 trillion in 2003 to US$1.7 trillion in 2008."[100] Videogames and hardware sales will contribute US$30 billion in revenues; they surpassed North America's film exhibition revenues in 1999.[101] China, India, and Russia will be high-growth markets for global entertainment between 2005 and 2010.

The industry's preferred vision is of a broadband-enabled game console integrated into the entertainment area of a smart home.[102] Game player demographics have simultaneously shed their 'youthful' image to embrace many different age groups, lifestyles, and values. Microsoft's corporate vice president J. Allard affirmed the 'HD era' at the International Games Developers Conference 2005 as the preferred vision of entertainment: "always connected, always personalised, and always in high-definition."[103]

The centrepiece of games growth to 2010 will be next generation consoles—Microsoft's Xbox 360 and Sony's PlayStation 3—which are scheduled for release in Q4 2005 and Q1 2006 respectively. The Xbox 360 includes support for custom play-lists, micro-transactions to trade game content, Xbox Live player communities, and an integrated marketplace for custom-built levels, game objects, and community-created content. Sony's PlayStation 3 uses 'Cell' a fast processor chip developed with Toshiba and IBM, and also supports the Blu-ray format for high definition DVDs.[104]

Key drivers for the videogames industry include: inter-firm competition in the console market; design innovations in consumer electronics; new platforms; and marketing channels. Key risks include content piracy; intellectual property debates; outsourced manufacturing delays; 'disruptive' technologies like peer-to-peer networking; regulatory impacts on videogame violence, censorship, and cross media ownership; standards wars; and technological obsolescence. These drivers and risks demand that videogame companies develop 'environmental scanning' capabilities, to anticipate marketplace disruptions and to seize opportunities for future growth.

Australian Industry Outlook

The Australian industry generated A$100 million in export revenues in 2002 and its global reach will continue to 2010.[105] Most companies work on a 'fee-for-service' basis with United States and European game publishers. State governments provide crucial infrastructure and

marketing support to these clusters, such as Multimedia Victoria's 'Game On' clusters policy and Queensland's 'Creative Industries' initiative. Evelyn Richardson, the Games Developers Association of Australia's (GDAA) executive director, notes that "we are known internationally for our creative talent and for delivering value for money." Whilst two major clusters exist in Brisbane (Queensland) and Melbourne (Victoria), Richardson prefers to promote videogames as a national industry to potential international clients.[106]

The Challenge of Next Generation Consoles
Evelyn Richardson believes that next generation consoles will create major demand in Australia's videogame industry.

> We estimate game development will rise from the current cost of A$8-10 million and a 50 person team per console title to A$20 million and require 120 person teams. The GDAA forecasts that 2000 people will be employed in the Australian industry by 2010.[107]

Whilst Australian companies have established a global reputation for game development and on-time project delivery, Australia does not yet have an internationally competitive publisher. Paul Boustead, a Smart Internet Technology CRC researcher, urges companies to develop their own content for franchise development, royalties, and to "get a better cut of the profits."[108] Marcus Westbury, co-founder of the FreePlay independent games conference believes the industry also overlooks the importance of independent developers for content innovation, mobile platforms, and as a potential workforce.[109]

The House of Representatives surveyed further opportunities for industry development and released its report in June 2004.[110] The Australia-US Free Trade Agreement creates potential export opportunities, whilst Canada, Ireland, South Korea provide models for successful clusters. Local firms need government help to purchase Software Development Kits that will provide technical specifications for the next generation consoles. The GDAA is also lobbying the Federal Government for a 10BA-style scheme for games development and urging closer links with venture capitalists and other entrepreneurial sources. "Talking to local games developers, many feel that venture capital options are increasing," notes CRC researcher Paul Boustead.[111]

The Office of Film and Literature Classification's (OFLC) failure to adopt an 'R' rating for games has been criticised. The OFLC's decision means that some overseas-produced games cannot be currently sold in Australia. Marcus Westbury notes this creates a ridiculous

situation "where players can avoid national regulatory boundaries by downloading games from online."[112]

Solving The 'R' Rating for Videogames
Mark Finn, a Swinburne University of Technology lecturer, believes the OFLC's decision to withhold an 'R' rating for videogames is driven by political pressures on policymakers.

> Reviewing videogame content from videotape screenshots means policymakers believe players are more passive than in reality. Personally, I think if we had some people on the OFLC who played games, and who understood the game-playing dynamic, then we'd have a lot more sensible decisions.[113]

Clear education pathways are needed for games designers, developers, and programmers in order to meet a projected shortfall of staff in the near-term. RMIT, Swinburne, La Trobe, Queensland University of Technology, and other institutions have created games-specific courses and curricula. Digital Game-Based Learning continues to mature. Yet the local industry needs courses that are action-learning oriented and project-based rather than single units on game graphics and physics.

Further development opportunities include continued tradeshow representation at the Games Developers Conference and E3; synergies with film, television, and other creative media industries; creating links between industry developers and cultural activities/precincts; creating an entrepreneurial and risk-taking culture for successful game franchises and licencing; enabling a supportive cultural infrastructure for local firms; and generating alternative sources for access to capital.

To become an internationally competitive 'industry of the future' Australia's videogames sector needs a holistic 'whole industry' outlook.

Innovation Models and User-Centred Design

The videogames industry has 'lessons learnt' from creativity and game production that can be applied to other industries. Games development requires an 'innovation culture' that is forward-looking, entrepreneurial, and favours execution over endless strategising.

Major developers like Sony and Electronic Arts have adopted Agile and eXtreme Project Management (APM and XPM) techniques. APM and XPM emphasise stakeholder dialogue and short iterations which trust emergence and feedback rather than command-and-control

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management. They provide important capacity-building strategies for implementing complex projects in high-pressure environments. APM and XPM are necessary 'best practices' if Australian developers are to avoid the project overruns their overseas competitors have endured.

Videogames are drivers of technological innovation and consumer uptake. Yet the 1990s console wars and failure of 'virtual reality' headsets show that, without user-centred design, technological innovations may fail. Therefore, user-centred design must be integrated into the games development process at the conceptual stage rather than as an after-thought.

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GameLab's Innovation Lessons
Eric Zimmerman's GameLab (http://www.gmlb.com) is an exemplar firm based in New York City that applies its innovation lessons for client companies. GameLab develops 12 projects annually.

> Because people work on multiple projects we get to explore a wide range of ideas compared with other companies where I took it for granted that projects took 18 to 24 months to create. GameLab investigates new forms of play, new kinds of content, new kinds of partnerships with different companies, new ways of learning through games, and new ways of telling stories with games.[114]

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University-Industry Collaboration and 'Incubator' Models

Academic expertise can be invaluable for game design research. Industry-university collaboration and knowledge transfer will be crucial for a long-term and viable Australian videogames industry.

> Swinburne University's Mark Finn contends that "academics definitely have a role to play because the games industry is still a long way away from reaching maturity." Finn highlights 'incubator' models like the MIT Media Lab and Finland's Hyperlab that are spaces where "we can combine creativity, technology, and multidisciplinary expertise."[115]

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Games Studies

Games Studies is an emerging academic discipline that examines videogames on their own terms. It represents a critical shift beyond cognitive, film, literary, and semiotic traditions to provide a context for videogames as 21st century media. Games Studies provides new concepts, insights, and tools that enable the development of games with a user-centred focus rather than technology upgrade cycles. "The key questions to ask," notes theorist Katie

Salen, "is what will the player *actually do* when they play your videogame? What will their experience *be like*?"[116]

Key theorists include Michael J.P. Wolf, Eric Zimmerman, Katie Salen and Espen Aarseth; many of whom write for *Game Studies* journal (http://www.gamestudies.org). The journal's disciplinary perspectives include aesthetics, narratology, ludology (the study of game-play), political economy and user-centred design. Two exemplar courses are taught at New York University's Interactive Communications program and New School University's Parsons School of Design. The Interactive Games Developers Association also holds conferences that feature theorists and industry representatives as panellists and speakers. This group of theorists and practitioners signifies a new 'school of thought' in the games industry that will become more influential by 2010.

Games Studies provides critical tools to help develop an understanding of how players-as-users interact with videogames and other 'immersive' virtual environments. Textbooks like Salen and Zimmerman's *Rules of Play* (2004) reveal how videogames 'remediate' other media, drive innovations for new interfaces, create 'liquid identities' for players, and provide simulations to experiment with 'what if?' thinking.[117] These insights underpin effective game design and playability testing.

"One reason why Game Studies is recognised is the sheer amount of money involved in the industry," Swinburne University's Mark Finn notes. "The economic imperative means games are now a force to be reckoned with."[118] Games Studies research will continue to broaden and deepen the developers' toolbox used to create new games and interfaces, and to better understand user experiences.

Digital Culture

Digital Culture provides a broader context than just technology to understand the world that videogames and players co-evolve within. Its emergence mirrors the Internet's mutative shift from being a technology infrastructure to becoming embedded within society. Digital Culture contexts create new spaces for user-driven innovations and digital lifestyles.

Digital Culture draws on the rich legacy of cybernetics scientists, avant-garde artists, and counter-culture movements.[119] It is often equated with Cyberpunk writers like William Gibson (*Neuromancer*) and Neal Stephenson (*Snow Crash*), with 'rave' dance culture and

postmodernism, and with Generation X and Y youth subcultures. Marketers tap into this for new products, and the 'cool-hunting' will continue.

Digital Culture and Innovation Models
Marcus Westbury, co-convenor of the FreePlay independent games conference, explains how digital culture and innovation models augment industry and government policies:

> I'm very aware of the collaborations that are initiated as the result of people meeting, and the ripple effects of that. It's a cultural space: opening up possibilities, platforms and frameworks to people that weren't there before. More concrete opportunities will develop. Fiercely independent game developers will feel more confident about what they want to do and [they] now have the skills to do it. Hopefully industry and government will recognise the talent and potential of independent developers and change what they do to respond to that. I expect both of these things will happen in an incremental sense.[120]

Future Directions

Smart Internet 2010 has identified the following as critical areas for high-growth strategies to 2010. These range from technological innovations that are product-centric to consumer-driven innovations that may 'disrupt' current industry strategies.

Massively Multiplayer Online Games

Massively Multiplayer Online Games (MMOGs) may be the videogame industry's biggest 'wild card' to 2010. Sony's *EverQuest* and LucasArts' *Star Wars Galaxies* are recent successes whilst Maxis' *The Sims* Online has been a surprise mega-flop. The key to success is giving players true interactivity in an MMOG world, and continued investment in network infrastructure.

The 'early adopters' at LAN parties showed that 'playing together' in groups recreates a social space in MMOGs that is missing from single-player computer videogames. The capacity-building nature of social networks architecture will ensure MMOGs gain further popularity in the coming decade. The fusion of MMOGs and social networks, with an understanding of Games Studies, will empower players, and create novelty via 'emergent' actions, hazards, and randomness.

Sony and other firms have lost millions creating 'immersive' game-worlds and infrastructures. Game developers discovered that players had their own goals in MMOGs

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and that new phenomena unexpectedly emerged. Insights from 'network theory' (small worlds, small-scale networks), artificial life and synthetic ecology ('swarming' and 'cascades') will provide scientific frameworks to design MMOG worlds and interact with game players. These frameworks provide a paradigm that goes beyond rules-based machine learning, and will be widely utilised in large-scale games development beyond 2010.

Virtual Economies and Microsoft's Xbox 360

MMOG 'virtual economies' combine the power of social networks with the creativity of the 'player-as-producer.'[121] Microsoft's Xbox 360 harnesses 'virtual economies' to enable players to trade game objects and custom-built game levels on the Xbox Live service. Microsoft's decision shows why games development companies must nurture sustainable player communities and co-evolve with them for long-term survival.[122] This is likely to include a 'soft' Digital Rights Management (DRM) scheme, which allows players to trade items without negative impacts on the game-world, and allows for collaborative generation of intellectual property. Secondly, the 'virtual economy' model allows players to explore Massively Multiplayer game-worlds that have different cultural, economic, and social systems.[123]   This knowledge base will help future generations to navigate the global problems of the 21st Century.

Mobile Games

Mobile games will continue to be important revenue drivers in the near-term. Mobile games development revives the 'retro' model of small developer teams rather than the development of larger projects. New developers may gain experience with mobile games and then move into designing games for consoles and other platforms. This employment pathway mirrors the relationship between 'indies' and 'majors' in the film and music industries. However, different phone platforms pose barriers to developers, who are also wary of hybrid game-phone products like Nokia's N-Gage.

Dense Immersive Communications Environment (DICE)

Dense Immersive Communications Environment (DICE) is a Smart Internet Technology CRC project that involves researchers from the Smart Networks program (University of Wollongong), the User Environments program (University of Tasmania,) and Telstra's Broadband Laboratory in Launceston.

CRC researcher Paul Boustead explains that DICE adds 'immersive voice' capabilities to Massively Multiplayer Online Games. "It involves the real-time creation of multimedia from dispersed sources." A *Smart Internet 2010* literature review independently verified that 'immersive voice' is highly sought after by veteran games designers. "Short term, I think voice chat is vital," explains designer Greg Costikyan. "And I don't see a networked console title working without it."[124]

DICE's first stage involved an opportunity evaluation of 'immersive audio', user and interface studies, and the building of personas and scenarios to aid further development. "We built a mock-up using the popular videogame Quake 3," Boustead reveals. The second stage involved Telstra's Broadband Laboratory conducting focus groups with hardcore gamers. "They thought DICE was very applicable to First Person Shooters [Doom, Quake] because it would significantly improve game playability and experience. People only want realism in games if it adds to game-play and the players' ability to implement strategies (ambushes, decoys, sneak into enemy camps). DICE enhances social network capabilities because 'it helps you collaborate on your own team and work together to achieve objectives. It deepens the experience because you can naturally talk to people."

DICE research problems will involve considering "two aspects: applications—what kind of future applications may be developed and what demands it will place on the infrastructure; and the network infrastructure—providing this audio service in a scalable way; how to build distributed service architectures; how to scale it across geographic regions, number of people in one area." Future DICE research involves "'working on more complex infrastructure issues . . . like shared infrastructures that reduce barriers to entry for Massively Multiplayer Online Games."[125]

Location Based Games use a mobile phone's functions (including GPS, Bluetooth® and camera) in variations of 'Capture the Flag', 'Treasure Hunt' or problem-solving. This new genre combines elements of Massively Multiplayer games, social networks and wireless mobile networks. Team-based versions of games enable online participants to collaborate with players in the real-world locations. Location Based Games have been a compelling service for 'early adopters' in the United States, Europe, and Australia. When combined with action learning techniques, Location Based Games become a powerful tool for situation-based education.

Social Networks

From the mainframe experiment *Adventure* (1978), to the player communities of *Doom 2* (1995) and *Counter-Strike* (1997), the videogames industry has pioneered how social networks are utilised. Social networks will further blur the boundaries between gamers and developers, and change industry development processes to 2010. Designed as a social experience, Sony and other firms believe they are the 'killer app' for Massively Multiplayer Online Games such as *EverQuest* and *Ultima Online*.

In the near-term, social networks will drive the integration of the Internet with next generation consoles. Microsoft's Xbox 360 capitalises on player communities to create new levels and game objects, which can be sold and traded via Xbox Live. Developers will continue to use hardcore players to beta-test pre-release games and create marketing 'buzz' around new titles. Hardcore players will become more important as development budgets soar for PC and console games.

Control of player-created intellectual property will continue to be a major barrier to mass uptake.[127] Mark Finn believes the games industry will develop different strategies to the music industry: "Unlike [commercial] music, game-players can create their own content in

some realms. It's just going to throw the whole intellectual property issue wide open."[128]
Current models range from complete control (Sony's *EverQuest*) to 'bounded' creation
(BioWare's *Neverwinter Nights*). Open Source collaboration and Creative Commons licences
offer one resolution, yet few firms are forward-looking enough to shift from product-centric
to customer-centric strategies.

Whilst 'strictly illegal', the 'retro' subculture that develops 'emulators' to run older games on
new platforms "will develop in the next several years," Finn suggests. The 'retro' subculture
believes that "early games had a simplicity and purity of game-play that the more
complicated and sophisticated videogames don't have."[129]

Player Communities as Developers
FreePlay's Marcus Westbury on why player communities are creating new
game development methods:

> The effects will not be predictable. The Internet is creating
> communities who are creating new games and ideas in very
> decentralised ways and means. On one level it's a group of
> 'modders' who hack Half-Life or whatever else. Beyond that and
> out of that grows a culture of creating games that draws on a
> range of other talents in a very Open Source form of development.
> It's allowing for development of new ideas that are coming out of
> other spaces.[130]

Genre Studies

Major game franchises like *Doom* and *Grand Theft Auto* have drawn on genre knowledge
from films, television, and literature to gain mass appeal. Games Studies theorists argue that
genre knowledge would differentiate Australian videogames from the unoriginal content
that floods the marketplace. "The input of people with expertise in film studies, particularly
genre studies, would be fantastic for the games industry," Mark Finn argues. "Any new
form of knowledge will give them a different spin."[131]

'Auteur' designers have taken these insights further. Shigeru Miyamoto (*Donkey Kong*,
Legends of Zelda), Will Wright (*SimCity*), Sid Meier (*Civilization*) and Peter Molyneux
(*Populous*, *Black and White*) have all used interdisciplinary knowledge from the humanities
and sciences to create their bestsellers. Australian firms need to adopt similar strategies
during their conceptual research in order to create best-selling franchises and protect their
intellectual capital.

The designers of Massively Multiplayer Online Games are discovering that players have internalised the genre conventions and use them with new levels of sophistication. Games Studies theorists and designers contend that MMOG need to evolve beyond *Lord of the Rings*-style role-playing games into new genre hybrids.

Gender-inclusive Games Design

Roberta Williams and Purple Moon's Brenda Laurel introduced games designers to gender-inclusive games design. Despite recent efforts by the International Games Developer Association, this remains uncharted territory that could 'disrupt' the industry in positive ways.[132] Gender-inclusive design would address the serious diversity issues the games industry faces. It would provide the industry with pro-active strategies to reframe the videogame violence debate, develop participatory alternatives, and to more effectively manage political risks.[133] Gender-inclusive Design also acknowledges the findings of Carol Gilligan and other researchers into how gender influences the stages of human moral development.[134] Integrating this scientific research into future games development would enable developers to anticipate the shifts in gamers' psychographic profiles.

11. Mobility
Andrew Simpson

In contrast to the technology-driven development of the past, the wireless future will become much more user driven. It is very important that the industry begins to focus on developing technology and services which solve real user problems. Usability and intuitive user interfaces are very important when access is through a tiny display. This is an area where operators, terminal vendors, and application developers need to synchronise their efforts. The failure of Wap, marketed as wireless Internet surfing, is an example of a vendor-driven technology with no clear demand, at least not with the terminals, services, and networks available at the time. Usability is probably the single most overlooked area by today's wireless industry.

Karlson, Bo; Bria, Aurelian; Lind, Jonas; Lonnqvist, Peter; and Norlin, Cristian— 'Wireless Foresight' (2003)[135]

While in some respects the use of the mobile telephone is jolting, that is generally because it is something new. However, it is in the process of pushing and nudging its way into a preexisting social context. It was not the case that we went from some sort of natural state of social interaction directly into real-time microcoordination via the mobile telephone. Rather, we have been so thoroughly enmeshed in an existing technical paradigm of time-based coordination that it has generally been taken for granted. In some respects, we have been in the position of being the fish that are vaguely aware of the water in which they are swimming.

Rich Ling—'The Mobile Connection: The Cell Phone's Impact on Society' (2004)[136]

The Mobile Internet of Today

We interviewed a panel of international experts on the mobile Internet to provide their personal views about the current position and the future of the mobile Internet.[137] The consensus view of our interviewees was that the functionality of the mobile Internet is limited at the present time compared to the utility of the fixed Internet. It seemed to one interviewee that we are "just scratching the surface" in terms of the functionality that can be created on the mobile platform. He noted that he had "barely done anything useful on the mobile Internet while mobile" and concluded that "the industry has a long way to go."[138]

Conversely Jeffrey L. Funk from Hitotsubashi University offers a more positive outlook:

> If you want to see the future of the mobile Internet, just empty your pockets, shoulder bags and briefcases. In Japan, mobile phones are already being used as portable entertainment players, cameras, membership and loyalty cards, guidebooks, maps, tickets, watches, and devices for accessing everything from news to corporate databases. Within a few years this list will likely include train and bus passes, credit and debit cards, keys, identification, and even money. It is also likely that the mobile phone will replace many of these items.[139]

Clearly, while these views do not stipulate definite timelines, the outlook is influenced by the developments emanating from Japan. Telstra's launch of the i-Mode service in Australia in November 2004 is perhaps a step towards the mobile Internet envisaged by some of our experts.[140] But who will be the mobile Internet users in 2010 and how will they use it?

Mobile Users

Four groups or *personas* were constructed that encapsulate the primary motivations of important types of mobile phone users. These groups are:

- Basic communicators (BC);
- Personal managers (PM);
- Lifestyle junkies (LJ); and
- Communicating machines (CM).

At the core of each persona are fundamental needs and aspirations. The purpose of defining a set of personas is for the design of a product mix that meets the needs of each group.[141] So if it assumed that these personas represent the broad groups of mobile phone users in 2010, questions need to be asked, what are the needs and aspirations of each and how can mobile carriers meet to fulfil their expectations?

Basic Communicators (BC)

Basic Communicators are mobile users who are interested mainly in the basic utility of voice calls. They want a simple, no-frills service that meets their needs with a minimum of fuss and hoopla. While they appreciate the convenience offered by their mobile phone, this does not include the use of many value-added features which are really just a waste of time to them. Basic Communicators are not interested in fanciful games or new fangled ideas that are foisted upon them by overzealous carriers or content providers. Eventually they may be persuaded to adopt some additional services such as SMS, but why would they ever need to take a photo with a mobile phone?

The essential attribute that Basic Communicators find attractive in a mobile phone is connectivity while mobile. The form of this connectivity is most likely to take the form of voice calls. There is a limited interest in data communications other than Short Message Service (SMS), and even SMS has limited use because predictive text and tiny keypads can be annoying user interfaces. Basic Communicators appreciate the benefits of a mobile phone but prefer not to pay more than a moderate premium above the cost of fixed line communications.

The extent of mobile coverage is important to Basic Communicators. A small number who live or travel in rural areas will be attracted to Code Division for Multiple Access (CDMA) phones rather than Global System for Communication (GSM) phones for this reason. The issue is that "coverage" means different things to different people, depending on whether the Basic Communicator moves around in city, rural, or international areas.

Some Basic Communicators will be attracted to mobile services as a substitute to fixed line communications. These Basic Communicators are people who see that combining these two services into one integrated service represents value for money, and do not really make much use of the Internet. If they have to access the Internet, they can use it at work or at an Internet café.

> Basic Communicators are mobile users who are interested mainly in the basic utility of voice calls. They want a simple, no-frills service that meets their needs with a minimum of fuss and hoopla.

Personal Managers (PM)

Personal Managers are rational people who are interested in improving the productivity of their personal and business lives. The mobile phone, and its value-added services, are essential tools that allow users to perform more efficiently at work and leisure. The emphasis is on utility rather than status or emotion.

Personal Managers are people who temper an interest in innovation with the belief that such services need to represent good value for money. Sometimes they may suppress their natural inclinations because their employer pays the telecommunications' bill. In this situation some Personal Managers may be somewhat more reckless in their usage pattens, and in other cases, they might assume behaviour more akin to Basic Communicators should the boss cease to pay the bill anymore.

Unlike Basic Communicators, Personal Managers are attracted to the daily use of data-oriented applications available on the mobile Internet which can be used to enhance their efficiency in their personal and business lives. This group is likely to maintain a comprehensive list of contacts in their mobile phone and is likely to use, or would consider using, a Personal Digital Assistant (PDA). Personal Managers find the synchronisation of the contents of their PDA and PC extremely convenient, especially where the PDA also incorporates the functionality of a mobile phone. They are attracted to the idea of a single device that combines the functionality of both a mobile phone and PDA.

In a similar vein to the PDA, Personal Managers are interested in mobile commerce (m-commerce), but the most desirable applications should offer genuine benefits that make a systematic improvement to their daily wellbeing. M-commerce applications that provide a marginal benefit, are difficult to operate, use an awkward payment mechanism, are poorly commercialised, or require a hefty premium over competing methods of payment, are unlikely to be successful. Where m-commerce offers a genuine advantage over competing methods of payment, such as a savings in time, a commensurate premium can be applied.

Personal Managers are moderate users of SMS, but at present there are still some uptake and user interface issues that bother them. First, Personal Managers with basic phones find the keystroke entry cumbersome and unwieldy. Once they can enter information more quickly, the 160-character seems to vanish before the detail of their message can be conveyed. Finally,

the management of SMS in the mobile environment is weak compared to the way messages are managed in the fixed world.

Personal Managers applaud the trend that mobile phones carry out an increasing range of functions for both personal and business purposes. The increasing utility provided by a time function, alarm clock, calculator, and FM radio are important measures that will strengthen the mobile phone as the device of choice into the future.

> Personal Managers are rational people who are interested in improving the productivity of their personal and business lives. The mobile phone and its value-added services are essential tools that allow them to perform more efficiently at work and leisure.

Lifestyle Junkies (LJ)

Lifestyle Junkies are typically younger people who like to express themselves in individual ways and personalise their communications. They consider their handset to be as much a fashion statement as a communications tool. They seek a sense of identity, to relate to a group, to be cool, are open to experimentation, and the level of personalisation they are able to command from their mobile service is paramount to them. They are frequent communicators and, together with voice, their preferred medium is SMS.

The Lifestyle Junkie likes to personalise her or her handset in a number of ways: by changing its physical appearance, and by learning to use new features that others might not know about. It is also the way they are able to "drive" a mobile phone that sets them apart for both communications and delivery of content. A more fundamental way to personalise the handset is to change it. Not only is it not cool to wear yesterday's old handset, but the release of new handsets, with sometimes dramatically different functionality, is attractive to them as well.

Lifestyle Junkies are innovators and participators whose actions eventually may influence other less intrepid users to follow in their path. There is a high level of informal viral marketing in this group that allows usage to grow quickly once some members of the same social group start using new applications. Once again SMS is the best example where the initial take-up in a leading edge group stimulates widespread use in other sectors.

Lifestyle Junkies are interested in content, service, and devices that offer or facilitate entertainment. They love to use portable music players such as Apple iPod or Sony Walkman players, they upload music, sometimes breaking copyright laws, and participate in competitions that create an immediate fun experience.

New and emerging technology is also attractive to Lifestyle Junkies. This includes location-based services that would allow them to connect with people and facilities in their immediate area. In the future, MMS may also prove popular as new applications are developed, provided their usage is not retarded by high tariffs. New handsets that offer choice of style and functionality will also be important.

> Lifestyle junkies are typically younger people who like to express themselves in individual ways and personalise their communications. Their handset is as much a fashion statement as a communications tool. They are willing to innovate and to experiment in the way they use the mobile Internet.

Communicating Machines (CM)

Communicating Machines are quite unlike any of the other people-oriented groups because they are fabricated around devices rather than people. However, it is people who will decide whether a particular variety of Communicating Machines are a good investment: a subset may work in conjunction with people through a man-machine interface between end-user and an access point. The persona of the Communicating Machine is both the business person who makes the deployment decision and, for those machines with an end-user interface, it is the Basic Communicators, Personal Managers or Lifestyle Junkies who must decide whether to interact with the Communicating Machines. The concept of the communicating machine and its relationship to end-users is depicted in **Figure 1** below.

Figure 1: Communicating Machines With End-User Interface
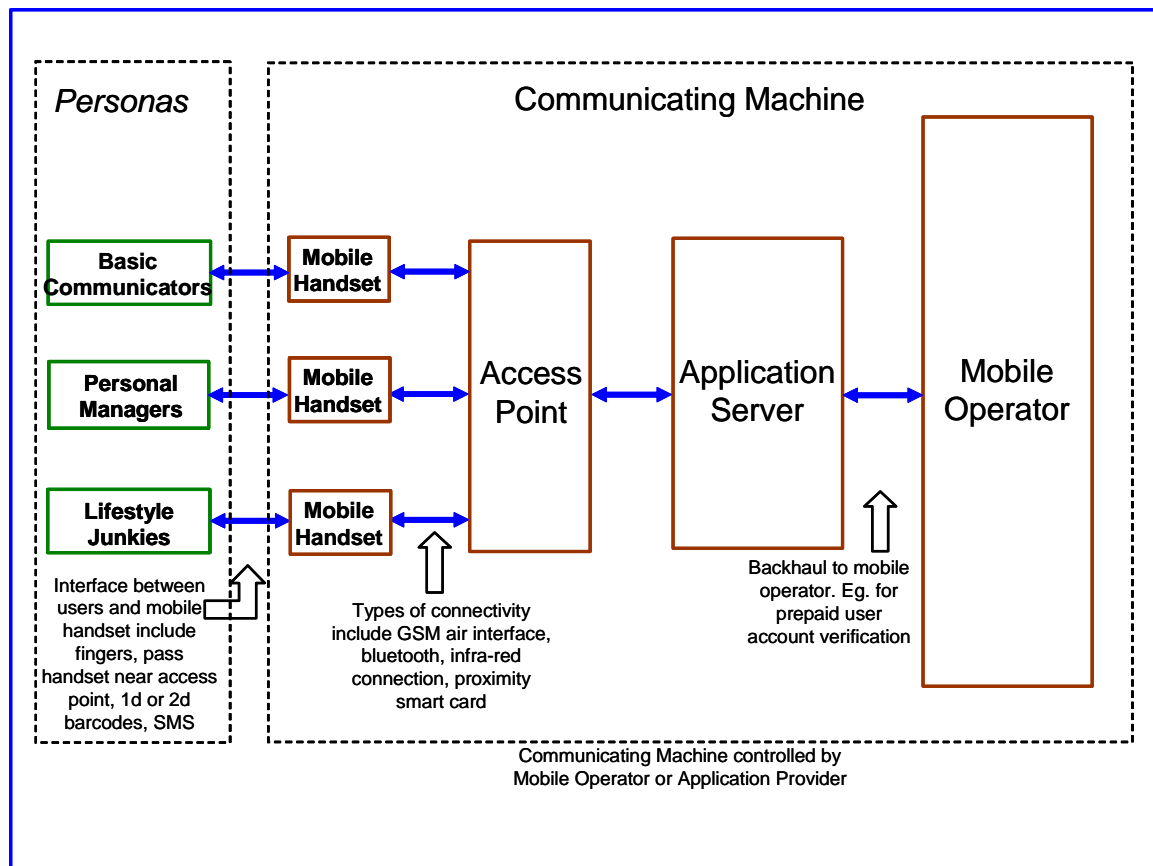
These devices may or may not have a mobile phone incorporated into them, but each has a form of communications connectivity with the outside world. Since the form of connectivity to the rest of the world comprise of cellular mobile devices, Wi-Fi, Wi-Max, landlines, satellite, contact-less smart cards or other communication technologies, the choice will depend on the method that is deemed most suitable for each particular application. Communicating Machines are also referred to as machine-to-machine communications (M2M).

A subset of the population of Communicating Machines will operate in conjunction with an adaptive interface with the end-user who may be a Basic Communicator, Personal Manager, or Lifestyle Junkie. This interface should be treated separately to the Communicating Machine because it should always be designed around the needs of the customer. The best design for the adaptive interface may not be best for the Communicating Machine. The Communicating Machine performs an essential role in the delivery of the end product or service, often providing 'backhaul' from a static or mobile installation back to a central monitoring point. It may even be that the end product or service to the customer is not technically feasible or economic without the CM.

The best known example of a Communicating Machine is the "dial-a-Coke" vending machine, which must satisfy two different types of user at the same time. Beyond its consumer service, the vending machine would also benefit from connectivity from the vending machine back to a central server. This would serve to reduce the frequency of site visits by a technician for re-stocking and maintenance as it would only be necessary to visit the machine as required basis rather than for regular field visits.

> Communicating Machines are quite unlike any of the other people-oriented groups because they are fabricated around devices rather than people. The persona of the Communicating Machine is both the business person who makes the deployment decision and, for those machines with an end-user interface, it is the Basic Communicators, Personal Managers or Lifestyle Junkies who must decide whether to interact with the
> Communicating Machine.

Case Study: Mobile Internet Car-Parking Payment Applications

Let's say that as a mobile phone user I want to pay for a parking ticket at a large parking station in one of the metropolitan cities of Australia. The first thing that confronts me is a range of uncertainties that I must resolve before I am comfortable making a purchase:

Uncertainty: Does this car park accept payment by phone? **Resolution**: Create a logo with a name that is standardised for all carriers - wherever people see this logo they know they can pay by phone. Display the logo prominently before entering the car park and at the pay station itself.

Uncertainty: How much will it cost? Is it the same charge as using coins or my credit card? **Resolution**: Wherever possible, make the charge the same as for payment by cash or credit card. This will remove a major barrier to its use. Merchants are used to paying a credit card charge, so the same principle should apply here. The premium SMS revenue sharing model is not applicable.

Uncertainty: I saw a Telstra logo near the pay machine. Does this mean I can't use the service because I am with Optus? **Resolution**: Create a logo with a name that is standardised for all carriers. You could also use the ATM model that displays the logo of each participating bank that permits access to this particular ATM. Where people see this logo and name (say "mobilepay"), they know they can pay by phone.

Uncertainty: My mobile phone is two years old. Will this service work for me or do I need to upgrade my mobile phone? **Resolution**: Put the standardised logo and name on compliant mobile handsets. The consumer knows that if "mobilepay" is on the handset, the handset will work.

Uncertainty: How does it work? Do I ring a number, do I need to receive a barcode on my phone though the camera on my phone? How does the car park system know when I came in and left? If I forgot to use my mobile phone on the way in, can I still pay on the way out? **Resolution**: These are all operational issues relating to the way the application is implemented. A real consumer bugbear of car parks is that every car park insists on implementing their payment system differently. So a mobile payment system really needs to be simple.

Uncertainty: I am on a pre-paid plan. Can I still pay through my mobile phone? **Resolution**: It is much better to include prepaid users. Otherwise it's really only a partial solution that is being offered and the potential revenues will be substantially diminished. Obviously there will be significant systems development issues, but carriers can work to solve them now.

Uncertainty: My battery is low. What happens if my battery runs out before I leave the car park? **Resolution**: The customer should either recharge the phone or pay some other way. It's up to the customer to keep his or her phone charged up, but the longer battery life has reduced the scale of this problem substantially.

In order to maximise the growth potential of the mobile Internet, it is proposed that stakeholders should:

- Understand that simplicity of operation on the mobile Internet is critical.
- Avoid fragmented solutions, encourage solution that embrace all carriers. Remember the importance of interoperability for SMS and always think how this applies to the emerging mobile Internet.
- Develop a universal "mobilepay" symbol that customers will recognise.
- Keep commissions in line with commissions applied by credit card operators for applications that compete directly with credit cards and cash. Recognise that the premium SMS model may not work for all application of mobile content.
- Be prepared to sacrifice margin for growth, as a strategy based on margin may be detrimental in the long-term.
- Identify all compliant handsets conveniently - not with an unwieldy list!
- Design systems that enable both post-paid and pre-paid callers to participate in mobile services.
- Embrace industry wide solutions.

Mobile Users in 2010

Let us jump forward to the year 2010 and explore four separate speculative propositions about how one of the four user groups has become dominant, or substantially more important, than it was in 2005. What does this mean in regard to the applications that have proliferated and how has each particular group managed to flourish? How could industry capitalise on the new direction of the mobile Internet?

Basic Communicators (BC)

> If the importance of Basic Communicators on the mobile Internet is to increase significantly by 2010, this will be due to a fundamental shift from fixed line to mobile communications.

The uptake driver for Basic Communicators is a fundamental shift from fixed line to mobile communications. This is brought about by a combination of factors which conspire to jolt the usually stable Basic Communicators into action. First, everyone in the household of Basic Communicators has a mobile phone, except for young children. This means that the fixed line in the house is really only a backup and, for voice calls at least, and is virtually redundant. Second, the arrival of third generation (3G) phones means that the delivery of Internet over the mobile phone is facilitated, as long as family users are not power users, or have high expectations of speed based on their existing usage of fixed broadband. Third, the

price of fixed telephony is increasing rapidly with access fees rising regularly while mobile charges are likely to fall regularly.[142]   Finally, while the head(s) of the household may be Basic Communicators, it is likely that younger members may be Lifestyle Junkies. The Basic Communicator may be influenced therefore by persons who are more open to innovation than they are.

How sensible is it for households to cancel their fixed line service in an increasingly mobile world? First, it is not actually necessary for households to cancel their fixed line service for this strategy to work, although many undoubtedly will. It is sufficient for calls to be shifted from fixed to mobile. In effect fixed line substitution may take the form of service substitution or call substitution. Both incoming and outgoing calls need to be considered. Second, in an environment where alternatives are available for voice, the only real imperative is to meet the needs for access to the Internet. If this can be accomplished without the use of a fixed PSTN line, the circumstances exist for significant fixed line substitution for Basic Communicators.

Personal Managers (PM)

> If the importance of Personal Managers on the mobile Internet is to increase significantly by 2010, this will be due to a fundamental shift from fixed line to mobile communications. The proposition is the same as for Basic Communicators, but it occurs for different reasons.

The main uptake driver for Personal Managers is a fundamental shift from fixed to mobile Internet. While the main uptake drivers in the case of Basic Communicators was value for money, voice, and basic Internet access, the driver for Personal Managers is that the mobile phone more reflects the needs of business people.

The use of SMS is likely to increase dramatically because there will be a change of culture in the business environment. A part of this change will be that the functionality of SMS is likely to increase to a level similar to email. With email there are good message management facilities that enable users to keep a log of incoming and outgoing calls, print messages, and distribute copies of these to colleagues. There are also 'out-of-office' notifications and delivery receipts. These facilities are not widely available for SMS, but all are relevant to the business user. It can be expected that once these services become widely available, it will create a change culture in the office where the mobile phone is central to the communications solution.

Lifestyle Junkies (LJ)

> If the importance of Lifestyle Junkies on the mobile Internet is to increase significantly by 2010, this will be due to enormous jump in mobile downloads and music swapping.

In 2010 Lifestyle Junkies are listening compulsively to music and video clips on their mobile phones, and are swapping music clips directly between friends. They have access to all the current music hits and downloading is mostly done legally. Apple's iPod has been abandoned in favour of a single, elegant, and sophisticated device that integrates the iPod and the mobile phone. While in transit, the Lifestyle Junkie can listen to music, but if an incoming call arrives, the music automatically pauses and nothing is missed. The uptake choice is simple due to technological convergence: the functionality of neither the mobile phone nor the iPod has been sacrificed, and the cost is reasonable.

The mobile phone of 2010 has become a mass storage device capable of holding large numbers of music clips and short videos. The development of new devices has been accompanied by new operational and support systems at the mobile carrier level. A micro-payment system has been put in place that allows mobile users not only to download music from the Internet, but also from other mobile users who are in close proximity. This occurs in a way that maximises the power of viral marketing to take hold. Finally, a set of innovative and workable solutions have been put in place between mobile carriers, record companies and other copyright owners.[143] The owners of copyright acknowledge that this channel to market cannot be ignored and indeed must be fostered. Accordingly, popular music and other rich media is made available to mobile phone users as soon as it becomes available on other media.

The dominance of the Lifestyle Junkie in 2010 suggests a prosperous time for the mobile carriers. The development of new systems has paved the way for a dramatic increase in revenue from mobile content in 2010. It depends on the needs of the Lifestyle Junkie being recognised and the right measures being put in place to accommodate their requirements. It is also recognised that the opposite approach of building business models around the old business objectives of copyright owners does not nurture the Lifestyle Junkie masses. Mobile carriers need to invest substantial resources in this area to ensure that the potential of Rich Media is realised by 2010.

Communicating Machines (CM)

The market for Communications Machines seems to be very attractive at first glance. The take-up of mobile phones among people is high, or perhaps saturated. By contrast, the take-up of communications devices in machines is largely untouched. The number of machines that could be fitted with mobile connectivity is seemingly unlimited or at least far in excess of the number of people in Australia. Furthermore, as pointed out above, the number of potential applications is almost endless. However, it is contended that the proportion of applications that will come into commercial operation on the mobile Internet by 2010, is unlikely to be substantial.

> There is no combination of circumstances that will lead to a fundamental boost in Communicating Machines as a source of profit on the mobile Internet. Niche markets require extensive customisation in each case, and the solutions found may not relate to the mobile Internet, or may not be financially sound.

he thinking behind revolves around two main concepts:

(1) A review of the widely canvassed applications for Communicating Machines suggests many have considerable potential for future uptake. Each of the applications requires considerable customisation and this means that each needs to be financially profitable and logistically viable. Due to the level of customisation required, it seems that Communicating Machines will represent a niche market at best. It is unlikely that any single driver can be identified up to 2010.

(2) The scale of the potential applications needs to take account of several factors that serve to deplete the pool of applications that could ultimately prove successful. While the universe of applications is unquestionably large, the number that will emerge is a small fraction. The applications need to generate revenue or reduce costs; they must benefit mobile carriers although other entrepreneurs could still benefit; they must relate to mobile Internet by definition; and must provide sufficient benefit in a cost-benefit study to overcome the cost of the initial investment. The diminution of qualifying applications from the universe of applications is depicted in **Figure 2** below.

Figure 2: Universe of Applications for *Communicating Machines*
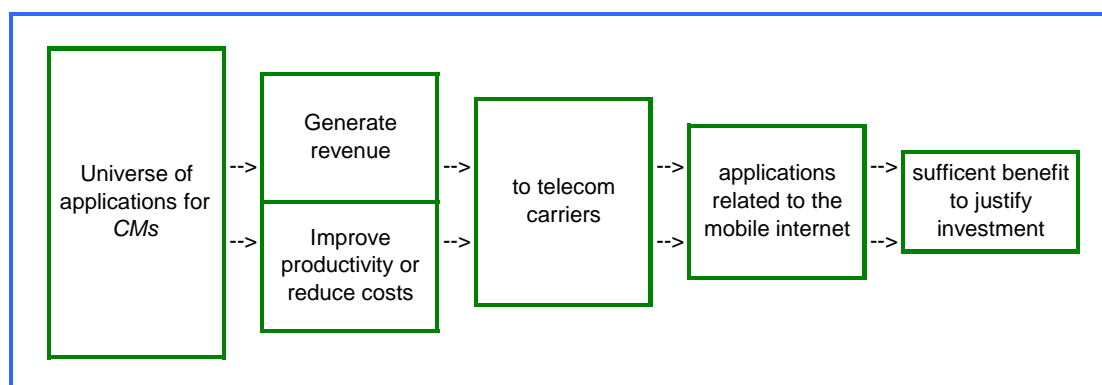
Conclusion

An overview of selected applications and features of the mobile Internet is shown in **Figure 3** below. This table shows the areas that could drive change amongst each of the personas. The changes to the mobile Internet suggested by the speculative propositions pose both opportunities and threats for mobile carriers in Australia in 2010.

Figure 3: Summary of Mobile Users in 2010

Persona/Group	Why The Importance of a Group Increases Significantly in 2010	Main Reason for Change	Recommended Actions by Mobile Carriers
Basic Communicators (BC)	Fundamental shift from fixed to mobile telephony through fixed line substitution.	BCs realise that mobile satisfy all their requirements and they do not need fixed telephony.	Offer special packages to the households of basic communicators comprising both voice on mobile networks and Internet plan on 3G for standard users, PSTN, FWA, HFC, or FTTH.
Personal Managers (PM)	Fundamental shift from fixed to mobile telephony, greater use of SMS, and 'pushed' emails to mobiles.	PMs rely on their mobile more: they do not need a dedicated office phone as the mobile serves this purpose, improved features associated with SMS underpins change in business culture, and the mobile office is extended to 'pushed' emails.	Offer special packages for business seeking to upscale mobile usage (e.g. text for business type services as an improved form of SMS, look at blackberry type solutions).
Lifestyle Junkies (LJ)	Music swapping and downloads.	LJs start to capitalise on new availability of high quality music on their mobile handset. Requires combination of change to storage capacity, development of appropriate micro-payment system, royalty plan with copyright holders and viral marketing among their peers.	Invest substantial resources to ensure that potential is realised (e.g. high storage handsets micro-payment systems, popular music and DRM systems are all in place).
Communicating Machines (CM)	No significant change can be contemplated. Universe of application for CMs does not generate revenue or reduce costs to mobile carriers on mobile Internet sufficient to justify investment.	Major change does not occur – market is a niche market full of many customised applications by its nature.	Resources ought to be focussed in other areas where the profit maximisation and uptake potential is higher.

V. Visions of 2010

Smart Internet 2010 asked "What might the Internet be like in 2010?" and "How might we be different?" This selection of quotes summarises the provocative alternatives and rich insights from our Australian and international experts. Their visions articulate a multiplicity of options that range from probable to preferable futures. Our interviewees highlight some of the implications of these changes from a user perspective towards 2010. These visions may be used for advocacy, dialogue, and as strategic inputs by business analysts and government policymakers.

Doug Rushkoff: "Non-linear understanding of the world"

The main changes will be away from text and towards video. All the chat will be video, global television networks will have figured out how to do single streams. I think we'll start to see a lot more aural and visual culture rather then this highly text based culture and we'll see a lot more giant immersive collaborative gaming spaces online. We haven't really created a medium indigenous to the Internet yet. We've translated letter writing and movie making and even the web, library making to the Internet space. The only thing that seems native to it so far is gaming, which really came up with interactive television. The hyperlink aspect of the web is native; it's a translation of footnotes. It's still a vestige of the text-based world. I think because the Internet is an outgrowth of television it's going to end up being the visual rather then text. I think literacy and everything that goes along with it; cause and effect, abstract thinking, fragmentation, individuality are all things that are going to submerge as a more non-linear understanding of the world emerges.[144]

Danah Boyd: "Mobile is key"

Ubiquitous. Mobile. First, there will be an information look-up component. I can be wherever, whenever and access information at my fingertips. This will be done through a mobile handheld. The computer will be resigned to be that which we produce text on. Communication technologies will be fractured by trusted networks. Instant messaging will be the primary tool of communication of the new workforce and there will be a generational divide. Media management will be chaotic, but everyone will be constantly sharing their creations in trusted groups. Brazil and Japan will be the primary pressure points on sociable technologies and the United States will have an entirely different construction of what that should be. Global technology connections will not eliminate xenophobia and more people will face run-ins with others from around the world. Basically, it's what we're already seeing… only mobile is key. And it will be wireless, VoIP mobile (unless legislation moves forward). The Telcos are dead in the water.[145]

David Rooney: "More commercial, less diversity"

I wonder if we will call anything the Internet in 2010? My sense is that convergence is going to be driven by big network television mostly in America. I think it will become a more commercial place but probably with less diversity. The big corporates will come to dominate. It'll be easier for people to go to Amazon, Fox or Disney. At the grass roots level, I think you'll see the blogging and Wikipedia stuff continue to grow. I think you'll see more virtual communities of practice in a number of different areas, mostly to do with cultural production. There won't be any dial-up access. How well you operate on the Internet will depend on interface design. I think the rent-seeking behaviour of the big Telco's has to have a lid put on it.[146]

Stowe Boyd: "A shift towards real-time interaction"

High powered mobile devices and ubiquitous connectivity will shift the Internet away from being a PC experienced domain, and we will see an enormous shift away from slow-time interaction via reading and writing web pages toward real-time interaction (a la IM, VoIP, and increasingly video). In 2010, 50% of everything being put on the web will be the record of real-time interactions. Likewise, corporate use of the Internet will shift away from mass marketing brochureware, and take on the flavour of social media, if not the complete spirit.[147]

Mark Pesce: "Informational pressure threatens hierarchies"

The world has changed far more than we are actually prepared to accept right now. The biggest thing that no one talks about and yet is still the most pervasive thing in our lives is informational pressure. The primary function of human beings in the West is to be information processors, and the more information we process, the more information there is to process. There's a constant informational pressure and it's deforming our culture, it's deforming our language, it's deforming all of the institutions that have to deal with it. Everything is deforming under that informational pressure. Rather than assuming the inevitable outcome of informational pressure is collapse, I'm assuming that this is a dissipative system, and in fact that informational pressure produces a higher form of organisational order. Certain institutional forms of organisational order, such as hierarchies, don't survive informational pressures well. They where born in order to satisfy informational pressures, but as McLuhan noted, when you speed anything up, one of its effects reverses. So the production of hierarchy, which was one of the functions of informational pressure, is now reversed into rhizomality.[148]

Cory Doctorow: "The Internet in our pockets"

I think that we'll have lots more filesharing. I think all that social wisdom about the Internet being in our pockets will be more and more true. Computers are really good at remembering stuff and humans are really good at understanding stuff. I think we'll see more and more of those partnerships. One of the things that I hope we'll see more of is computers that understand our reactions to things and that allow us to organise our own world and help our friend's organise their world.[149]

Darian Stirzaker: "Lifestyle is key"

New areas of consideration are things like: potential lifestyle, community/tribal needs, mobility, ease of being able to use the multiple access methods seamlessly, and ego gratification. What I call 'other enablers' are like digital cameras, iPods, next versions of Sony Playstations which are broadband and potentially higher speed wireless [2.5 & 3G] capable. These other enabling devices are more likely to shape lifestyle and convenience needs than the access technology itself.[150]

Howard Rheingold: "Millions of producers"

The oversimplified way to look at it is that in 2010 we could have a very rich cultural and intellectual and political medium online, with millions of producers as well as billions of consumers -- in music, instead of one or two megastars who make billions for their global companies, there will be hundreds of thousands of garage bands, each with its loyal constituency of a few thousand. We'll see people building on each other's work and transforming media -- the way the users of the personal computer, Internet, and web did. Or the small number of companies that control most of the communications and content in the world will use law and regulation, baked into the hardware itself, to make sure that the only innovators are those who work for them, and who sign over the lion's share of their work to their masters.[151]

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Trevor Barr has been a regular national media commentator for a long period, notably on ABC Radio, with AM and PM, Background Briefing, and regularly on Terry Lane, but also on Australia's leading news and current affairs television programs, including Four Corners, and the 7.30 Report. In May 2001 Trevor was invited to deliver one of the prestigious Alfred Deakin Lecture Series as part of The Federation Festival in Melbourne where 53 leaders in their field were invited to discuss critical issues regarding Australia's future. Trevor is also currently Co-Chair of the Telstra Consumer Consultative Council (TCCC), a national consumer advisory body to Telstra.

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In 2003 and 2004 Dr Turner was elected as Vice-President of the Tasmanian e-Health Association (TEA). The TEA was established to ensure connectivity between the IT and health sectors and to enable Tasmania to respond to the challenges and grasp the opportunities emerging in e-Health.

Dr Turner has produced more than 75 peer reviewed academic publications for conferences, journals and books.

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