

at RMIT

**Centre for International Research on
Communication and Information Technologies**

CIRCIT Policy Forum Report

Designing for Australia's Online Future

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The Centre for International Research on Communication and Information Technologies is a research centre at the Royal Melbourne Institute of Technology.

CIRCIT was set up in 1989 to provide independent research and education on information and communication services. The aim is to create new knowledge that is relevant to the community, industry and government so as to increase the social and economic wellbeing of people in Australia and other parts of the world.

The CIRCIT research program is structured around three main themes:

1. Use and Users of Information and Communication Services

The research focuses on the use of information and communication services by residential users, small businesses, corporations and government. It covers the broad area of communication in activities such as payments and finance, work, health, education, entertainment and government services.

2. Policy and Regulation of Information and Communication Services

Policy and Regulation of Information and Communication Services focuses on national strategies and objectives, competition, and issues of access and equity.

3. Information and Communications Industries

Information and Communications Industries research deals with developments in information technologies and services, industry policy and infrastructure issues.

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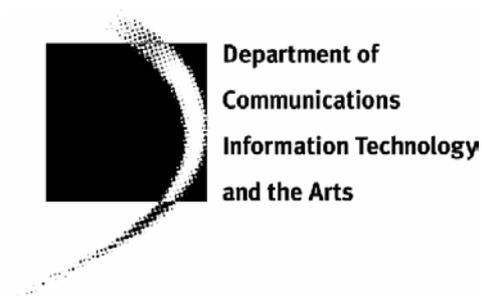


Table of Contents

Preface	1
Executive Summary	3
1. Context	7
1.1 The Challenges of the Forum	8
2. Common Elements and Outcomes of Discussion	9
2.1 Committing to Good Design	9
2.2 Skills to Create Sustainable Information and Communication Services Industries	11
2.2.1 Design Skills	12
2.2.2 Communications Literacy	13
2.3 Enriched Communities	13
2.4 New Models: New Attitudes, New Services, New Businesses	14
3. Electronic Commerce	15
3.1 Good Design Criteria	15
3.2 Design Skills Deficiencies: A Mismatch Between Designers and Users	17
3.3 Ongoing Learning and Training	17
3.4 Key Enablers – Linking Good Design and Effective Use	18
3.5 Strategies to Improve Australia’s Skills Base and Good Design Capabilities	18
4. New Media	21
4.1 Development of New Media Industries: Attitudes, Skills and Models	21
4.1.1 The Culture of Capital Markets	21
4.1.2 Collaboration is Crucial	22
4.1.3 A Networked Culture Requires a Variety of Skills	22
4.2 Development of Content and Media	22
4.3 The Value of Understanding Audiences and Users	23
5. Rural and Regional Australia	25
5.1 Regional and Community Growth Through Online Services	25

5.2	The Issue of 'Infrastructure' – Now On or Off the Agenda?	28
6.	Conclusions	33
6.1	Post Forum Activities	33
6.2	Issues For Further Attention	33
	Attachment 1: Forum Participants	35
	Attachment 2: Forum Model and Workgroup Approaches	37
	Attachment 3: Forum Agenda (summary)	41
	Attachment 4: Forum Background	43
	Attachment 5: Connecting Use and Design of Information and Communication Services	49
	References	53

Preface

This is the report of the third annual CIRCIT Policy Forum. This series was initiated in 1996 in association with the Aspen Institute's Communications and Society Program. The Forum structure enables a wide range of stakeholders from industry, government and the community to clarify key issues in the development of the communications industry and the services it provides. It encourages the consideration of strategic implications and desirable actions based on the insights developed by participants.

Planning for the 1998 Forum began with a focus on how the demand and supply sides of the industry could be better linked – whether leading edge production and leading edge use of communication and information technologies go together, and how this might be encouraged. The “leading edge” concepts did not sit comfortably with the Reference Group. The focus shifted from these to the activity of design as the bridge between production and use.

The design of processes and products is well understood in other industries, but not so well understood in the development and application of networked services. This report outlines some of the complexities and desirable actions to develop an Australian capability.

The report complements and extends aspects of the recently completed *Australian Strategic Framework for the Information Economy*¹, particularly in the emphasis on skills development. As the Forum participants made clear, user-centred design skills are core to the effective development of online services, but are not yet sufficiently emphasised. This emphasis on design is being maintained in other CIRCIT research such as the project *Gender, Design and Internet Commerce*.

The Forum was an enjoyable and stimulating event. Its success depended on the willing engagement of the participants, the contributions of facilitators, and the detailed planning work of the CIRCIT research and administrative staff. I would particularly like to thank Phil Singleton and Phil Flaherty who helped to plan and implement the overall Forum process; and Dr Diane Sydenham, Dr David Williamson and Professor Trevor Barr who took on the very demanding tasks of facilitating the workgroups.

Claudia Slegers, Dianne Northfield and Pam Seeney took the major roles in organising the background material, reports, and logistics, assisted by Ross Kelso and Choong Chin. The merit of their work is confirmed by the very positive comments of participants.

John Burke
Director, CIRCIT

¹ Ministerial Council for the Information Economy. (1998, December) *A Strategic Framework for the Information Economy: Identifying Priorities for Action*. At: <http://www.noie.gov.au/docs/strategy/strategicframework.html> (accessed on 18/3/99)

Executive Summary

On 18-20 November 1998, the Centre for International Research on Communication and Information Technologies (CIRCIT at RMIT) conducted a Policy Forum focusing on *Linking Design and Development of Information and Communication Services to Effective Use*. Twenty-nine invited industry, government and community leaders and researchers workshopped the topic.

Design was seen as a broad concept, ranging from design of equipment, user interfaces, content, business and other processes, through to the design of systems and processes utilising information and communication services, at an organisational or broader societal level. Design, in all of its varieties, was considered from the perspective of meeting the needs of users.

The Forum reached strong conclusions about the following:

User-centred design is crucial to the acceptance of new services

- Design underpinned by understanding use and users is smart business sense. User-centred design is critical if Australian service providers and producers are to grow a domestic market and trade competitively in global markets.
- Design underpinned by knowledge of the cultural context of use recognises that people mix and match new and traditional forms of communication and payment across their activities. A contextual approach also encompasses the activities of non-users, examining, for example, how business, payments and learning are conventionally conducted.
- Good design is an iterative and cyclical process involving:
 - ◆ User/cultural research coupled with knowledge of the technical possibilities;
 - ◆ Strategic design, imaginative content development, and useability testing;
 - ◆ Implementation, evaluation and refinement.
- However, user/cultural research and useability testing require both time and money. This should be built into the development plans for services by government and industry.
- Local developers need to design for the 'unknown' or global customer if Australian service providers and producers aim to trade with global and particularly regional markets. The customer base and relationships built over time will be a key asset for further development.

Skills to develop sustainable Information and Communication Services industries

- A combination of skills are necessary for successful design: artistic/content design skills, technical skills, business skills, and knowledge about the cultural context of use. This spectrum of required skills may result from collaboration between groups with different skills (for example between artists/content developers and entrepreneurs) and/or from particular groups acquiring skills outside of their domain of expertise.
- Skills shortages exist across the value chain, from developers and producers through to end users. For example, developers in industry and education require more knowledge of user-centred design, and business or entrepreneurial skills to fully exploit their products/services; end users require communications literacy.

- A national audit of design skills is required to understand skill requirements, existing capabilities and deficiencies, and sources of learning and training. Tertiary courses to train user-centred interface designers and useability practitioners are disappearing, and there are few organisations with internal groups examining the cultural context of use and useability.
- The government, education system, and industry must help meet the demand for skilled designers through targeted courses and programs on user-centred design and/or content development. Programs for all Australians, including unemployed people and youth, are one course of action. Accreditation of private courses is another.
- The considerable talents of youth in technical and creative skills should be harnessed in ways that are constructive for young people and the community generally.
- Governments should facilitate and publicise communications literacy for end users through TAFE courses and other adult education centres and programs.
- The education sector is important to a future economy as both a provider of skills and a consumer of online services. All schools should be connected to online services internally and externally, and teachers made familiar and comfortable with them. Governments must facilitate teachers to undertake communications literacy courses that focus on technology use in an educational context, whilst recognising the burden this places on their time.

Enriched communities, not just rollout

- The introduction of online services in rural areas may lessen economic activity if there is no holistic regional strategy. Productive regional information economies – driven from the community, not urban-centric – can address both economic and social objectives.
- Communities should develop increased understanding of their economies (imports, exports and what is exchanged internally) and what the community does well. They can then consider the role of online services in exploiting their strengths. Identifying local leadership and champions is an important part of the strategy.
- A holistic approach should also be valid in certain non-rural contexts, such as urban fringes and depressed urban suburbs.

New models are required for the development of Information and Communication Service (ICS) industries

- Leaders in business, government and community must “break the existing frame” with new models of business and collaboration, to exploit the opportunities that exist.
- Education and industry need to improve their collaboration. Developers, in education and elsewhere, often lack business and entrepreneurial skills to take their initial concepts and exploit them in a commercial context. They would benefit from collaborating with entrepreneurs who can help them in exploiting their ideas and products, and/or gaining business skills. Other ventures might enable talented multimedia students to train with state-of-the-art equipment and so provide industry with graduates who are skilled and experienced in innovative design.

- Governments must cooperate to bring together the online provision of services of local, state and federal government in order to make a multiple entry approach available.
- Innovation is also impeded by limited access to capital markets. The Capital Gains Tax is a disincentive to private sector investment in development.

The Forum also identified a number of outstanding issues requiring further exploration and debate outside the confines of this Forum. These issues are discussed further in Section 6.2:

- The right telecommunications infrastructure must be in place.
- How can Australia's human resources be marshalled?
- How do we develop a more collaborative culture?
- How can we build policies that are more user-centred?

1. Context

The question of examining the links between production, design and use was stimulated by consideration of the 1997 Information Industries Taskforce (IITF) Report which stated that:

*...Australia must be a leading edge user **and** producer of information and communication technologies. Leading edge producers and leading edge users form mutually reinforcing relationships. Rarely does one exist in isolation from the other²*

If this is a desirable relationship, how can it be developed? The IITF report presented a number of challenges. Among them were:

- Enabling and empowering users: getting online to the 21st century;
- Enhancing skills formation, education and training; and
- Enhancing research, development and innovation.

These challenges were not the subject of much subsequent debate, which focused more on the recommendations for support of industry development. They have, however, been partly addressed either directly or by parallel developments. The Department of Industry, Science and Tourism (DIST) *Business Online*³ program has proposed the objective of at least 90 per cent of businesses in specific industry sectors (identified as benefiting from being online) using online business systems in the next five years.

The draft consultative document *Towards an Australian Strategy for the Information Economy*⁴ extends *Business Online* in emphasising the stimulation of use of ICS as a policy focus as well as the more established areas of industry development and competition policy. Among the major priorities identified are:

- Train our workforce to harness opportunities within the information economy;
- Increase significantly the use of electronic commerce by Australian business;
- Develop the Australian information industries;
- Implement a world class model for delivery of all government services online; and
- Ensure the integrity and growth of Australian culture in the information economy.

Observing these developments, the Forum sought to explore the following questions. Are the supply side industry development policies supporting the demand side approaches of market stimulation and understanding demand and use? How can we ensure new Australian services are well designed for effective use by household and business customers, both within Australia and in the overseas markets we seek to enter? What must Australian businesses and the education sector do to achieve best

² Information Industries Taskforce Report. 1997, *The Global Information Economy: The Way Ahead*, Department of Industry, Science and Tourism, Executive Summary. Canberra; AGPS. Page 2.

³ Information Industries and Online Taskforce 1998 *Getting Business Online*, Report for the Department of Industry Science and Tourism (DIST) At: <http://www.dist.gov.au/infoind/busonline/gbo.pdf> (accessed on 30/3/99)

⁴ Ministerial Council for the Information Economy, 1998, *Towards an Australian Strategy for the Information Economy*, July. At <http://www.noie.gov.au/index2.htm> (accessed on 30/3/99)

design? What is the role for the public sector – as demanding users, as service providers, as educators, and as policy makers?

1.1 The Challenges of the Forum

The Forum examined the above questions with the aim of stimulating ideas and outcomes among a group of influential people, through focusing on three key areas of application:

- **Electronic commerce:** We have been told that Australian enterprises can and should see the world as their potential markets. Our governments are setting out regulatory and legislative frameworks to enable e-commerce transactions. We can identify some outstanding small business success stories using the Internet, yet there is a sense of unease about the reluctance of mainstream Australian business to seize the opportunities that e-commerce presents. What can be done to encourage faster progress? Is the design/use relationship relevant?
- **New media⁵:** The “new media” industries present an exciting prospect for export and employment growth, as well as a vehicle to preserve and demonstrate Australian culture and values to the world. Australian production houses are growing and spreading their operations abroad. Yet there is some frustration with the lack of quality Australian multimedia content in online services, and a fear that foreign-dominated content distributors and “Internet portal” sites will dominate in future. Can we act to ensure that our creative talents are nurtured and rewarded appropriately?
- **Rural and regional Australia** (including provision of education, health and government services). The potential for economic and social benefit from the widespread adoption of online services seems self-evident, yet policy debates continue to focus on regulatory disputes about the costs and nature of services provided, while conventionally delivered services, such as banking, continue to withdraw to the urban centres of population. Are we capitalising on our design/innovation/production capabilities in rural Australia?

Consideration of the links between the design, development and effective use of ICS within the above domains of electronic commerce, new media and rural and regional Australia, are presented in Sections 3 to 5. Common themes, which emerged from the Forum’s workshops and the plenary sessions, are discussed in Section 2.

An outline of the Forum model (or methodology) and agenda can be found in Attachments 2 and 3.

⁵ For the purposes of Forum discussion “new media” was defined by participants as “products and processes arising from convergence of telecommunications, content/media and information technology”.

2. Common Elements and Outcomes of Discussion

A number of overarching themes emerged from the plenary sessions and the three workgroups focusing on electronic commerce, new media, and rural and regional Australia. Associated actions for government, industry and community were also identified. These are summarised below.

2.1 Committing to Good Design

Good design is central to the successful adoption or acceptance of new services. Poor design can lead to costly misjudgments if the rollout of services is not matched by compatible demand and use. For example, the supply side push to roll out Australian state government services online has not been accompanied by significant use of such services by small businesses, despite high levels of interest among proprietors in conducting online transactions with government.⁶ This suggests the value of a focus on design as well as availability of services.

Developing Australia's design capabilities capitalises on an existing national strength of creativity and innovation. Moreover, as Australian businesses seek to develop new services for overseas markets with different cultures and languages, Australia's diverse multicultural communities become a major advantage that is shared by few, if any, countries in this region.

Design that is underpinned by research about use and its cultural context will make services more likely to be used and hence more commercially successful. Building a Graphical User Interface (GUI), a website, or a multimedia title is risky and expensive. User-centred design can be seen as a way of managing this risk, and helps service providers double-check that the service/product they are designing meets their goals.⁷ Designing for the most challenging of users, such as people with disabilities and the aged, can inform good design for all users, making the service more accessible and therefore likely to be used by more people.⁸

User trust can be built through embedding relevant user guidance and support features in services, through engendering a feeling of control and comfort⁹ with the service, and via two-way feedback channels which are ongoing between designers/service providers and users. The delivery of targeted information to business and customer users can facilitate user trust and enhance the return of customer information to service providers. This is explored further in Section 3.

⁶ See Slegers, C., Singh, S., and Hall, J. 1998 *Small Business and Electronic Commerce: An Australian Survey*. Research Report No. 22. Melbourne: CIRCIT at RMIT.

⁷ For further discussion of the importance of user-centred design in risk management, see Bloomer, S. 1998 Applying User Centred Design to Electronic Commerce. In VOUG Newsletter June 1998 pp 20-24.

⁸ Schofield, J. and Flute, J. 1997. Use and Usability: A Guide to Designing Interactive Multimedia for the Public, Report prepared for Multimedia Victoria.

⁹ For an exploration of the importance of trust in the acceptance of electronic money see Singh, S. and Slegers, C. 1997. Trust and Electronic Money. Policy Research paper No. 42. Melbourne: CIRCIT at RMIT

Design underpinned by knowledge of the social and cultural context of use recognises that people supplement – not substitute – traditional forms of communication and payment with online services across their activities. This contextual approach also encompasses the activities of the vast populations of non-users, examining for example, how shopping, learning, and business are conventionally conducted. There is a growing body of cultural research and market research which uses a range of methods – observation of peoples’ activities and behaviours, interviews and focus groups – to inform the design of new online services with understandings of culture and behaviour.¹⁰

In order for Australian service providers and producers to trade with global and particularly regional markets, local developers need to design for the ‘unknown’ or global customer.¹¹ The customer base and relationships built over time will be a key asset for further development. Designers may learn about this from websites in other countries.

Good design is an iterative and cyclical process involving a number of elements, including:

- User/cultural research and technical knowledge of what is possible;
- Strategic design, imaginative content development, and useability testing; and
- Implementation, evaluation and refinement of the service.

However, user/cultural research and useability testing demands both time and money. This should be built into the development plans for the services. Government and industry must commit to this user research. The education system is key here as a primary information base or source.

Designers, in the new media industries in particular, may benefit from time to experiment and ‘play’ with new characteristics of media being developed. The creative role in content development, as well as the design of the services and/or physical equipment, should be recognised. Those at the concept end do not always know what they are finally developing, as there may be multiple or unintended applications of services originally designed for a specific purpose. Youth, and others who immerse themselves in the new media through play, can add valuable input into the design process.

¹⁰ See Holtzblatt, K. and Beyer, H. 1993. Making customer-centered design work for teams. Communications of the ACM. Also accessed at http://www.incent.com/papers.indx/Customer_Des_Teams.html (accessed on 1/4/98); Posner, B. Inside a Converted Schwinn Bicycle Factory at <http://www.fastcompany.com/online/05/elab.html>. (accessed on 20/12/98); Bloomer, S. Croft, R. and Wright, L. 1997, ‘Collaborative design workshops: a case study’. In Interactions, January/February.; Singh, C. and Slegers. 1998. Small Business and Electronic Commerce. Policy Research Paper No. 44. Melbourne: CIRCIT at RMIT; Schofield, J. and Flute, J. 1997. Use and Usability: A Guide to Designing Interactive Multimedia for the Public, Report prepared for Multimedia Victoria.

¹¹ For an exploration of the design of online services for money management and shopping in meeting the requirements of diverse cultures and markets, see Singh, S. 1998, Gender, Design and Internet Commerce: A Reflection on the Australian Experience, Paper prepared for the PRICAI 98 Workshop on Issues of Cross Cultural Communication, Singapore, 24 November 1998.

Increased visibility of user-centred design could occur through the following actions, facilitated by collaboration between education and industry:

- Establish a joint government-ICS industry-business Design Institute;
- Initiate a national award for outstanding electronic commerce design; and
- Promote case studies of excellence in use of online services.

Information industries and businesses must raise the profile of good design on the public agenda, drawing attention to benefits such as globally competitive new businesses; lower unemployment; more relevant services; and cost savings in service delivery.

Government can help encourage good design developments with visual content by facilitating low cost accessible bandwidth.

2.2 Skills to Create Sustainable Information and Communication Services Industries

Successful design benefits from a combination of skills such as artistic/content design skills, technical skills, business skills, and knowledge about use. These skills may result from collaboration between groups with different skills (for example between artists/content developers and entrepreneurs) and/or from particular groups acquiring skills outside of their discipline.

If the Australian community is to be a major beneficiary of the 'information age', we must be among the leaders in making the transition to an 'information age' literacy, or communications literacy. Communications literacy includes the traditional elements of literacy – reading, writing and arithmetic – but now also must include skills to use a personal computer, email and the World Wide Web, and an understanding of the role online services can play in domestic and commercial activities.

The Forum concluded that a range of skills are required across the value chain, from developers and producers through to end users. For example, developers in industry and education require more knowledge of user-centred design, and business or entrepreneurial skills to fully exploit their products/services; end users require communications literacy. This is mapped in Figure 1.

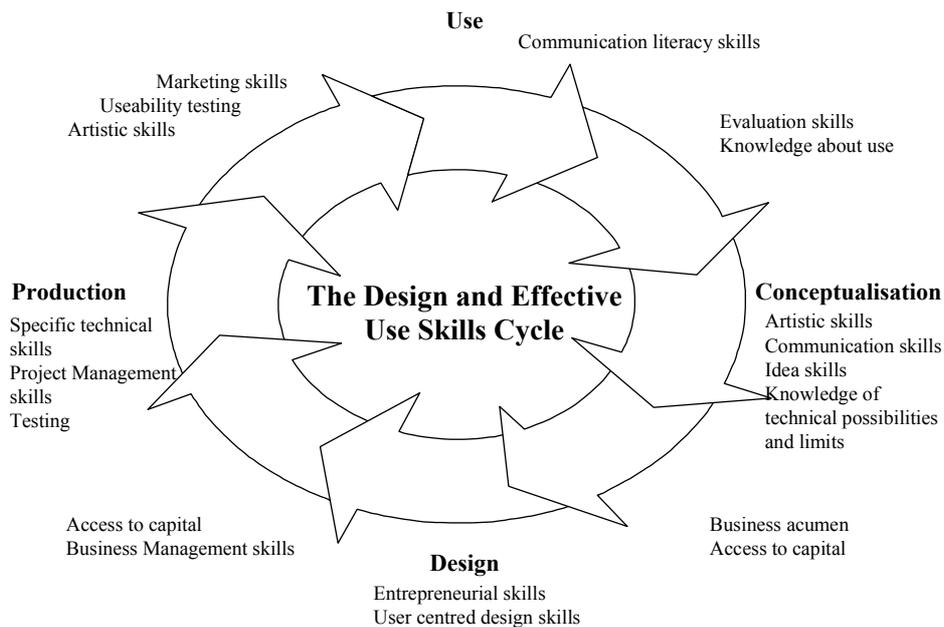


Figure 1: The Design and Effective Use Skills Cycle

2.2.1 Design Skills

Although data exists on the acute demand for skills in information systems and computer programming in Australia and overseas,¹² there is a paucity of specific data on design skill requirements, existing capabilities and deficiencies, and sources of learning and training. A national skills audit is required to understand the gaps. Current Australian Bureau of Statistics categorisation of design skills and information technology skills requires consideration in this light. The proposed audit is discussed further in Section 3.5.

Tertiary courses to train new user-centred interface designers and useability practitioners are disappearing, and the number of organisations with internal human factors and useability groups can be counted on one hand.¹³ The government, education system, business and ICS industries can help meet the demand for skilled designers through targeted courses and programs on user-centred design and/or content development, as well as communications literacy.

¹² See Australian Information Industries Association (AIIA) – Education and Training Activities Program, *IT&T Workforce Gap Hurts Australia's Future*. At <http://www.aiia.com.au/6ETworkforcegap.html> (accessed on 25/10/98); Department of Employment, Education Training and Youth Affairs 1998 *DEETYA Job Futures*. At <http://www.deetya.gov.au> (accessed on 24/10/99); Australian Information Industries Association 1996. *Demand for Skilled People in the IT&T Industry Toward the Year 2000* at <http://www.aiia.com.au/6menuactivities.html> (accessed on 2/11/98); *The Diminishing Pool of Skilled Federal Information Technology Executives: IT Brain Drain Report* by Information Technology Resources Board. At <http://www.itrb.gov/itbdrpt.htm> (accessed on 15/12/98).

¹³ Bloomer, S. 1998 *Ethnographic Approaches to User Interface Design*. Presentation to CIRCIT's Information Symposium on 23 September 1998

These targeted courses and programs should be aimed at all Australians, but especially unemployed people, older generations and Australia's youth, who have considerable talents in technical and creative skills. School curricula should include principles of good design in a broad sense, for example presentation of information and an understanding of the user's perspective, as well as communications literacy. Other actions to elevate design skills are discussed at length in Section 3.5 on electronic commerce.

2.2.2 Communications Literacy

The education sector is important to a future information economy as both a provider of skills and a consumer of online services. All schools should be connected to online services internally and externally, and teachers made familiar and comfortable with them. Other countries (for example United Kingdom, the United States, and Canada) place special emphasis on education, providing incentives to learners and greatly discounted infrastructure, equipment and services as a community good. However these countries also need to focus on communications literacy.

Governments must facilitate and provide resources for teachers to undertake communications literacy courses focusing on using technologies in an educational context.¹⁴ Recognising that this is a much more complex task than mere training, such courses should be in the form of teacher in-service professional development. Governments should facilitate and publicise communications literacy for end users through TAFE courses and other adult education programs.

2.3 Enriched Communities

All communities can be enriched through the use of online services, rural communities in particular. The rollout of online services in rural areas runs the risk of lessening economic activity if there is no holistic regional strategy. In some instances the introduction of online services may actually accelerate the decline of smaller rural communities. Productive regional information economies – driven from the community, not urban-centric – can address both economic and social objectives.

Holistic strategies for regional community growth can occur through:

- Communities developing increased understanding of their economies (imports, exports and what is exchanged internally) and what the community does well. Communities can then understand the role of online services in exploiting the opportunities.
- Identifying local leaders and champions.
- Creating a shared learning experience among communities by publicising exemplars of effective (networked) community developments and encouraging discussion.

Programs that enable communities to prepare and implement such holistic strategies must be resourced by government. A holistic approach should also be valid in certain

¹⁴ An approach that is aimed at the educational context should use strategies which have been developed in the classrooms by teachers with all the other constraints and demands placed upon them.

non-rural contexts, such as urban fringes and depressed urban suburbs. The holistic approach is discussed further in Section 5 on rural and regional Australia.

Centres for pooled community access to online services, though important and necessary, should not be seen as long term substitutes for affordable permanent connections to homes.

2.4 New Models: New Attitudes, New Services, New Businesses

Leaders in business, government and community must consider new models of business, process and collaboration, to exploit the opportunities that exist.

Education and industry can improve their collaboration through joint ventures. Collaboration is presently hindered by distrust and frustration on both sides. A venture between education and industry might enable talented multimedia students to train with state-of-the-art equipment and so provide industry with graduates who are skilled and experienced in innovative design. Developers, particularly in education, often lack business and entrepreneurial skills to take their initial concepts and exploit them in a commercial context. They should either collaborate with entrepreneurs who can help them exploit their ideas and products and/or learn business skills.

Collaboration within and across universities has also yielded innovative design. The RMIT University 'Superbike' project is one example of a successful endeavour using a multidisciplinary team with diverse areas of expertise. Driven initially by an RMIT Sports Engineer's plan to build a faster bike for Australian Olympic cyclists, the team grew to include other aerospace engineers, nutritionists, polymer/chemical engineers, human movement experts, cyclists, industrial designers, specialist librarians and marketing experts, each individual from across the university offering unique knowledge from their field.¹⁵

Innovation may also be impeded by limited access to capital markets. Governments should restructure Capital Gains Tax so that it is not a disincentive for private sector investment in development and is in line with our major competitive markets for investment (for example the USA).

Government must cooperate to bring together the online provision of services of local, state and federal government in order to make a flexible multiple entry approach work.

Government should facilitate better exploitation of intellectual property developed through its activities in outsourcing and contracts.

The following sections, on electronic commerce, new media and rural and regional Australia, give detailed consideration of the links between the design, development and effective use of information and communication services within these domains.

¹⁵ Thompson, L. (1999) *RMIT Superbike, Networking and Research* Presentation to Discovering RMIT Induction Program, 16 March 1999

3. Electronic Commerce

An agreed definition of ‘electronic commerce’ is:

Conducting any form of business over networks, involving commercial and non-commercial activities and information gathering.

While consideration of electronic commerce at the Forum was ‘Net-centric’ - in the context of the Web - the issues raised are relevant to other online mediums. Four key areas of discussion are outlined below:

- Identifying criteria for ‘good user-centred design’;
- Skills deficiencies in both the design and use of electronic commerce;
- Factors enabling the development and use of electronic commerce in Australia; and
- Suggested strategies to improve electronic commerce design and promote use.

A detailed discussion of the approach taken by the workgroup can be found in Attachment 2.

3.1 Good Design Criteria

Two underlying themes shaped discussion:

1. Conceptualising design in a holistic context, noting the interrelated aspects of:
 - Important elements in the design process – technical, interface development, content development and presentation of information, communication;
 - The importance of designing in the context of social, cultural, political, and economic environments; and
 - Linking design to requirements of business and community users.
2. A view that all people are designers, regardless of different vocations and daily activities. This leads to a need for cultural and attitudinal change to elevate recognition of the role of good design and the importance of generic design skills development across the population.

In examining aspects of ‘good design’ a key theme emerged – that, whether from an education system, business or community point of view,

All design benefits from being user or demand-driven.

A shift to demand-sensitive attitudes in design processes is vital. This is coupled with a need for designers to understand customer information and to build customer confidence through design. The development of two-way and ongoing information flows between designers and users is an important component to be included in the design of all online services. In this sense, building a relationship with the customer and processes for two-way interaction are integral elements of interface design (including cost). Good/bad design can either facilitate or kill an electronic interaction before it even begins.

The delivery of targeted information to business and customer users could facilitate user trust and enhance the return of customer information to service providers. A key element of building trust is to embed relevant user guidance and support features in services, including protection of customer rights. In this respect, amendments to

privacy legislation to cover online interactions may be necessary¹⁶. Pre-design activities, for example prototype testing of services with customers, were seen as an important aspect of gathering user information. Design has a key role in changing attitudes and supporting the uptake of services such as distance purchasing. Here good design could assist in overcoming Australian's cultural resistance to mail ordering and distance purchasing.

Rather than seeing electronic commerce as a panacea, designers need to recognise that users continue to mix and match different communication mediums – old and new – for different purposes. Recognition of the household dimension of online services use is a further central factor of design in order to accommodate placement of different equipment in different parts of the home. Electronic commerce developments should increase or optimise customer choice of different services, service costs and communication channels, both online and traditional. Designers need also to be alert to the possible outcome of design in reducing options through constant software upgrade requirements, increasing the lifecycle/replacement costs of user equipment and services and their functionality.

Customer choice is also seen as important in relation to providing information, or personal profiles, to service providers: customers may be prepared to receive inferior services to retain the right not to provide personal information if there is a possibility that it will be passed on to a third party. Alternatively, users may be prepared to pay higher costs for services tailored to personal profiles. Designing for the unknown customer in offshore markets, where direct user information is lacking, is a further issue. A suggested means of facilitating relevant design in this context is to examine the design and content of local Web sites in target markets.

¹⁶ The National Privacy Principles have been produced in advance of legislative amendments to the Privacy Act passing through the Senate. The latest version of these (Jan 99) is at: http://www.privacy.gov.au/news/p6_4_1.pdf (accessed on 20/3/99). The Government announced on 16/12/98 that it did intend to pass national legislation regarding privacy protection that would cover the private sector in addition to the public sector. At the moment, the only requirements imposed by the Commonwealth on the private sector are through government contracts with individual suppliers, including major outsourcing providers, plus: a) Credit providers and credit reporting agencies which must comply with the credit reporting rules in the Act (and in a legally-binding Code of Conduct) for the handling of credit worthiness information about individuals; and b) Those who hold and use tax file number information must comply with tax file number guidelines issued by the Privacy Commissioner under section 17 of the Act. In addition the privacy rules under Part VIIC of the Crimes Act apply to anyone who might collect, hold or disclose information about some old criminal convictions. Beyond the areas outlined above, the private sector is not subject to the Federal Privacy Act. However, the Privacy Commissioner has the power under section 27 of the Act to encourage corporations to develop programs for the handling of personal information which are consistent with the OECD guidelines for the protection of privacy and transborder flows of personal data on which the IPPs are based.

3.2 Design Skills Deficiencies: A Mismatch Between Designers and Users

Discussion of design skills deficiencies was grounded in recognition of a dearth of specific data in Australia that adequately breaks down and quantifies:

- design skill requirements;
- sources of learning and training across different skill sets; and
- existing capabilities and deficiencies.

This led to one of the key recommendations of the discussion: the conduct of a national design skills audit as outlined in Section 3.5. The lack of existing data was also a motivation to identify key criteria for good design as outlined above.

3.3 Ongoing Learning and Training

Design skills development is an *ongoing activity* for both designers and practitioners within the education system and business training contexts. In order to foster generic design skills across the population, the development of curricula at the primary school level to promote design literacy should be encouraged. Information presentation, communication, and use of information technology skills for both designers and users of online services are also key skills for inclusion in primary, secondary and tertiary level education programs. Representing design skilling as play rather than work may facilitate a shift in thinking to view design skills development as part of a lifelong learning process, rather than a discrete taught process.

There is a need to move beyond expanding the design programs and skills existing in Australia, to produce new skills for tomorrow. Lifting our sights above low-value telephony call centres¹⁷ should support high-value design capabilities across a range of new services and applications. There is also value in drawing on the creativity of young people especially, but also older generations, in building Australia's base of knowledge workers.

Given the recognition of a range of skills requirements supporting 'good designers', the development of the following is recommended:

A more flexible demand-driven design approach to education and training to position Australia to take advantage of electronic commerce and create employment.

Broad change to the educational system will involve major effort and time. However, specific actions and points in the education system that may be responsive to elevating design skills on the agenda include:

- The development of short courses to address specific skills gaps, i.e. Java programming offered on a six month, part-time basis;
- Increased certification options (education and business based), including broad acceptance of training credits across educational institutions and businesses;
- Encouragement of more private providers of skills;

¹⁷ Participants also recognised the importance of improved design to enable greater quality of existing call centres.

- ◆ Businesses need to reconsider their tendency to employ candidates with the full raft of skills required, and recognise that many design skills are learnt in a ‘training and doing’ context;
- Targeted government and education programs to attract skills from overseas to address specific shortages;
 - ◆ This might be done through streamlining of immigration laws to attract foreign skills to fill specific design skills gaps;
- Facilitating the development of basic design and information technology use skills at an early age, as part of Australia’s ongoing learning activities;
- Promotion of Australia’s online design education opportunities overseas;
- Promotion of collaboration between education providers in developing design curricula and recognising credits across institutions; and
- More concerted efforts by government and business to retain local skills.

3.4 Key Enablers – Linking Good Design and Effective Use

The development and use of electronic commerce can be facilitated by the following factors:

- Increasing accessibility of, and reduced cost of, bandwidth;
- Targeting taxation incentives – for example, business tax deductions for design training programs and for implementation of electronic commerce systems. The imposition of a goods and services tax on online services was regarded as an inhibitor to electronic commerce development.
- Improving consumer confidence in online services, encompassing aspects of trust, personal rights and privacy protection, with a call for online services privacy legislation development via the Attorney General’s Department.
- Raising the profile of electronic commerce on the public agenda through emphasising opportunities for employment, new technology developments, new business and service opportunities and cost savings in service delivery.

3.5 Strategies to Improve Australia’s Skills Base and Good Design Capabilities

Specific actions to address design skilling issues are noted in the foregoing discussion. In addition, the group identified three major activities to support skilling, good design and overall raising of awareness of design.

- A National Competition for Outstanding User-Centred Electronic Commerce Design. CIRCIT is recommended to develop this idea in association with relevant departments at RMIT. The option of possible sponsorship by a company was canvassed, with the competition focused on design to sell a specific product. Drawing on existing material (curricula, designer handbooks, case studies, etc.) the competition evaluation criteria should rest on a listing of key elements of ‘good design’. The competition should aim to draw a maximum number of entries from Australia and have the key objective of heightening the profile of design in this country.

- Conduct a National Audit of Skills (capabilities and deficiencies) in the design of electronic commerce systems. This would facilitate targeted and relevant education course development, business training programs and student recruitment strategies. Such an audit would need to consider non-formal sources of design learning – for example in the home – and would need to take a holistic approach in examining skills requirements across different aspects of design – beyond technical skilling. It was suggested that RMIT may provide appropriate experience and infrastructure in these regards.
- Promotion of educational and business publication of case studies of excellence in electronic commerce design to highlight where user-centred design has worked, how and why.

The conclusion arising from discussion is that engendering good design skills as a key aspect of Australian culture would have far ranging benefits, flowing from the effective use of electronic commerce.

4. New Media

For the purpose of this discussion, an agreed definition of new media is:

Products and processes arising from convergence of telecommunications, content/media and information technology

Ambiguity characterises this domain: it involves linking content into new channels with a focus on use and users on the one hand, and an emphasis on creative content development on the other. A clash of the three cultures (information technology, telecommunications, and content) occurs because each tends to have its own agenda and historical development path. This is in part due to regulation or the lack thereof. An account of the approach taken by the workgroup can be found in Attachment 2.

Discussion of linkages between production, design and effective use in new media focuses on industry development and design in the broadest sense: the design of business processes, and systems or processes utilising information and communication services at an organisational or broader societal level.

The significance of the creative role of the artist or composer in new media content is highlighted, in light of the focus on design of interfaces and equipment/devices which may characterise other domains such as electronic commerce. This is discussed further in Section 4.2.

4.1 Development of New Media Industries: Attitudes, Skills and Models

4.1.1 The Culture of Capital Markets

Australian new media innovation is impeded by limited access to capital markets and few venture capitalists. These are prevalent in the United States.¹⁸

- The Capital Gains Tax is currently a disincentive to private sector investment in development. Governments should consider restructuring the Capital Gains Tax.
- Venture capitalists looking to invest want a Chief Executive Officer who can gain quick acceptance on the stock exchange. However Australian developers, in the education system and elsewhere, often lack business and entrepreneurial skills to exploit their initial concepts in a commercial context. They would benefit from gaining business skills and/or collaborating with entrepreneurs who can help them exploit their ideas and products.
- Australia needs a more risk-taking culture. Australian corporate investment practices tend to be inherently conservative.

History shows that the perceived value of markets can be as important as real value. For example, the company Amazon.com is highly valued in the market place because of its loyal customer base and the creation of brand awareness. Over time the company's model has evolved to focus on increased customer service.

¹⁸ For discussion of difficulties of financing innovation in Australia see Northfield, D. (forthcoming) *The Information Policy Maze: Global Challenges, National Responses* Chapter 6. Melbourne: CIRCIT at RMIT.

4.1.2 Collaboration is Crucial

Further collaboration between education and industry is a major priority. At present collaboration is hindered by distrust and frustration in both domains. Those in industry perceive that developers in education do not accept their overtures due to fear of losing control of the development or intellectual property. Meanwhile, developers in education feel frustrated with the perceived lack of support from industry. Joint venture activities may, for example, enable talented multimedia students to train with the latest equipment and provide industry with graduates who are skilled and experienced in innovative design.

Collaboration is also hindered by business attitudes in Australia's cottage media industry. Small multimedia developers do not want someone else to come in and ruin the enterprise. In the United States, a failing business will hire management and marketing experts, in contrast to Australia where the company is liquidated and staff are dismissed.

The clash of cultures between media/content, information technology and telecommunications is also seen to hinder useful collaboration.¹⁹ Mergers between companies from the different media have failed because of the clash of different business models and the realisation by different players of where their core business lies.

4.1.3 A Networked Culture Requires a Variety of Skills

The development of new media requires a wide spectrum of skills including writing, music composition, art, information systems knowledge and business know-how. However, the prevailing strategies and courses are seen by some as 'media blind' in that they focus on low-level information technology skills rather than high level (medium-appropriate) content skills. In this regard they are merely compounding the problem and skills shortages.

The combination of skills required for good media design could come from collaboration between groups with different skills and perspectives, for example between artists/content developers and entrepreneurs²⁰. Alternatively, particular groups involved, such as artists, may benefit from acquiring skills outside of their discipline.

Young people and teenagers have significant technical and creative skills. However, these talents should be harnessed in ways that are constructive for young people and the community generally.

4.2 Development of Content and Media

The creative role of the artist or composer in new media content is recognised as well as the design of the services and/or physical equipment. This can make the development process more akin to architecture, which has a creative element, than the design of a device. However multimedia development is currently constrained within a

¹⁹ It was acknowledged that this breakdown of alliances is not unique to Australia, and is in fact a global trend.

manufacturing industry mindset (mass-produced products) whilst the media creation/content/information industries operate with a different paradigm: consider the structure of the ABC, BBC, NBC as information services.

As such, a narrow ‘electronic economy’ approach to new media development can send individuals and governments into a global-get-rich-quick gold-rush frenzy. In their haste they fall over themselves and fail to identify the distinctions and attributes of the medium or the culture in which they are applying it. Hence good development of new media may benefit from time to experiment and ‘play’ with characteristics of the media. Those at the concept end do not always know what they are developing, as there may be multiple or unintended applications. The significance of this element of ‘playing’ and experimenting is why young people may contribute significantly to new media design.

4.3 The Value of Understanding Audiences and Users

New media creation, which is underpinned by research on use, is smart business practice. By aiming to make services fit the way people do things, they are more likely to be commercially successful. This is not about making developers feel good about including users. However, user/cultural research and usability testing needs both time and money, which must be built into the development of the services. Government and industry must commit to this user-focused research.

User groups for new media are fragmented and diverse. New media users are less easily defined and described by demographic categories than occurs in other domains, such as electronic commerce. The recognition of specialty interests (“the audience of one”) can help target hitherto untapped niche markets. The following are some user groups:

- Special interest groups, for example: genealogy, country music
- Users for work, or for study
- Users for fun, entertainment ...
- Teenagers, children
- Home-users
- Blue collar, white collar...

More research is required on how people want their entertainment, and on their entertainment habits. For example there is a need to examine:

- Activity and habits in the home environment, as this domain is where new media applications may make the most impact.
- What services and content will be appropriate for different ways of living and different entertainment requirements?²¹ For example, some people may choose Web TV because they have individual needs which do not connect with others in the home.

²¹ Since the introduction of the Internet many consumers have been exposed to freeze-frame content and may be conditioned to accept image latency rather than full motion.

- How do users/audiences move across various data types? How do they use different devices for different types of new media? How far will divergence be accepted by people? Consumer desire may not always be for more choice.
- What content is most appropriate for characteristics of the new media? History shows that United States interactive television trials in the 1970s were flawed partly because the content was not compelling. A related issue is the recognition of pornography as an important driver in takeup: when/if this content is taken out of the loop an important driver may be removed.
- How do people's different Internet connection arrangements affect their patterns of use or 'viewing'?

5. Rural and Regional Australia

Consideration of the links between development, design and effective use in rural and regional Australia involves two key issues:

- a) The key components of a regional information economy and the threats and opportunities arising from online information and transactions;
- b) The adequacy of telecommunications infrastructure deployed in, or required, by rural and regional users and their communities.

5.1 Regional and Community Growth Through Online Services

Consideration of development in rural and regional Australia requires the revisiting of some fundamental understandings such as: what constitutes rural regions and communities, the relationship between government and its citizens, and appropriate design of online services for rural and regional users?

Once possible shortcomings arising from inadequate infrastructure are put aside, the key issues for users are:

- Equity of access – this is very much a matter of affordability, as many rural users have incomes below that of their urban counterparts;
- The ability and willingness to use online services – this in part becomes a matter of service design that meet needs, coupled with awareness raising regarding the benefits provided.

There is no easy answer to improving affordability. Solutions fall somewhere between the two extremes of:

- the government mandating a high level of service availability at prices broadly comparable to that for urban users,
- the provision of safety-net arrangements funded as a social security.

In either scenario, competition would assist via a downward pressure on prices.

There is enormous potential to expand demand and innovative use of online services by rural and regional users. Such potential can be sensibly addressed by attention to design and development issues, after which many potential users may be more likely to recognise the benefits from going online.

For generations, the trend towards regionalism has resulted in the demise of many smaller, economically weak, towns. Due to the prospect of online services substituting for physical service delivery and thereby causing local unemployment, it is possible for the unplanned introduction of online services to accelerate the economic downturn in many towns and their associated communities. Reductions in face-to-face contact across the counter, for example, can ultimately lead to the departure of whole families. The economic multiplier consequences for a given town can be severe and on the micro-scale, perhaps inevitable. Alternatively, a more deliberate approach to a whole region, treating it as a community to be transformed towards an information-based economy, may offer greater prospects for resilience.

A holistic regional strategy is required for the introduction of online services. The approach should be driven with the community as its focal point rather than superimposing influences from a distant urban centre and the associated urban-centric

information flows. Such a strategy should be capable of successfully addressing both the economic and social objectives of the regional community. It requires a stocktake of the community's present economy, its potential for growth and sources of capital (financial, physical and social) coupled with a realistic assessment of online service trends and impacts. As few communities possess the necessary expertise to undertake such an exercise, external skills may be needed.

In particular, a holistic approach to regional community growth requires the following:

- Increased understanding by the community of its various sub-economies (imports, exports and what is exchanged internally) and what the community does well;
- Due to their graphic-rich content, education, health and other major government and utility services are most speedily delivered to the community via broadband telecommunications infrastructure. Intra-community communications will tend to be dominated by e-mail services and hence require low bandwidth infrastructure. Most importantly, the stocktake and subsequent analysis needs to identify the community's potential for exporting information and sourcing financial transactions, by capitalising upon what opportunities are unique to the region. Refer to Figure 2 for a depiction of these components of a regional information economy.

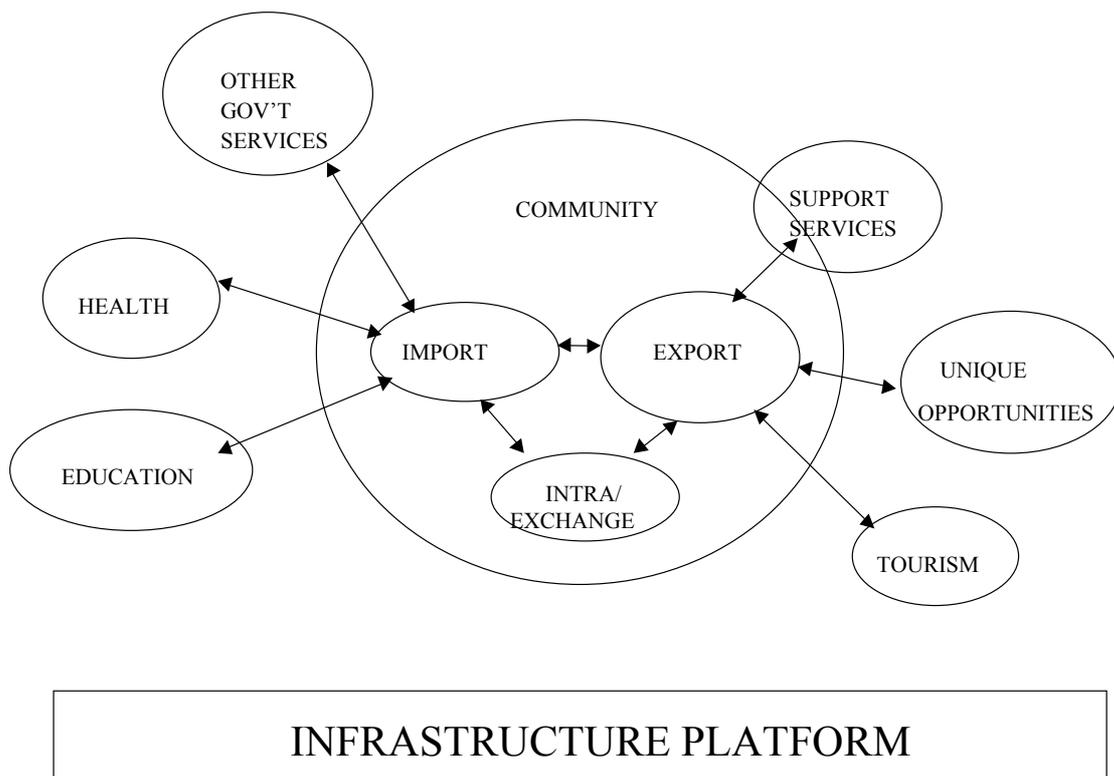


Figure 2: Components of a Regional Information Economy

- Design of the appropriate role for online services to sustain economic activity and community well-being;
Key elements leading to a design that fosters community growth through online services are:
 - ◆ Promote leadership/envisioning of the regional future;
 - ◆ Capitalise upon local champions: ideally supported by local government, community organisations; local committee; and representatives from all sectors;
 - ◆ Identify needs and opportunities: shared learning opportunities, identification of local resources, external relationships (with government, with urban centre);
 - ◆ Develop strategies (for infrastructure, technologies, services and use): opportunity for aggregation of needs and hence infrastructure/services, how to actually go online (exemplars/field days/road shows);
 - ◆ Undertake design phase, followed by trials, to achieve community driven and owned online products: scope community benefits (outcome), gain thorough understanding of community culture, address specific needs, appreciate service delivery context, aim for local development with global appeal, utilise discrete components within customised framework;
 - ◆ Implementation of online product.
- Identification of local leadership and champions who can promote the vision and benefits of online services;
This includes harnessing the talents of women who are often at the forefront of rural change (particularly regarding entry into the information economy²²), and young people who often exhibit a considerable ability to appreciate new technology. Further, retired people may have more time to learn about new services and demonstrate the advantages to their communities.
- Creation of a shared learning experience among communities by publicising exemplars of effective (networked) community developments within a comparable environment;

One such example, although not necessarily translatable into every regional community, is that of the Blackall Internet Café²³ – Queensland’s first Bushlink

²² The Rural Women Online project provides one example. Initiated by QUT researchers in association with public and private sector industry partners, the project has facilitated rural women’s involvement in community development activities and the making of telecommunications policy, as well as developing effective consultation and research processes. The successful electronic discussion group, *Welink*, involves research team members, some industry partner representatives, and women from a range of rural contexts across Queensland and other States and overseas. Rural contributors have predominantly initiated topics of conversation. These have ranged from strategies for identifying and capitalising on niche markets for the beef industry to women’s health issues, education, leisure and entertainment activities. More information is at <http://www.circuit.rmit.edu.au/seminars/daws.html> (accessed on 11/2/99)

²³ *World’s first outback café blazes trail for bush town.* At <http://www.qld.gov.au/BushTel/html/view.cgi/46.1998-03/worlds.txt> (accessed on 4/12/98); Simpson, L (1998) *Use of and expected benefits from the provision of local Internet access - Interim report, Stage 1 - Implementation Blackall Bushlink Internet Cafe*, Report to the Department of Public Works and Housing and Information Industries Branch, Queensland Government. Brisbane: QUT; Simpson, L (1998) *Use of and expected benefits from the provision of local Internet access - Interim*

Resource Centre. The locals of Blackall, with a population of about 2000, have literally lined up to develop and post their own pages on the Web.

A holistic approach to 'community-centric' online service development should also be valid in certain non-rural contexts. These include urban fringes and depressed urban suburbs, as there is likely to be little substantive difference between the key elements of regional and urban communities.²⁴

Finally, if all three levels of government cooperated in delivering their online services by aggregating demand for infrastructure through the consolidated provision of services to institutions in rural and regional areas (viz. schools, libraries, hospitals, other agencies), and to kiosks and other community centres, the larger bandwidth would better serve all users in a general sense and, in particular, stimulate businesses and communities to exploit such capacity for developing their own export-oriented economy.

The following matter deserves further attention:

So that regional communities may survive and grow within the new information economy, programs should be resourced that enable communities to prepare and implement holistic strategies for online service development.

5.2 The Issue of 'Infrastructure' – Now On or Off the Agenda?

The scope of telecommunications infrastructure encompasses not just physical plant and equipment, but also radio spectrum, numbering schemes, software-derived databases and systems combining sets of infrastructure. Upon a given infrastructure platform, services are then developed or derived for end-users. However, the distinction between a 'service' and its related 'infrastructure' may not always be clear. For example, an obligation to deliver a 'universal service' to a remote region is in reality an arrangement to provide the underlying infrastructure. The actual service may then be provided if requested. On the other hand, accessibility to a service doesn't necessarily dictate actual use. Service uptake raises further questions of need, awareness, useability and affordability. The following aspects were considered as being of disadvantage to the delivery of online services to rural and regional areas:

- Infrastructure in areas of low population density is typically more costly to provide and maintain than in urban areas. Furthermore, service quality is more likely to be inferior.
- Rural service may be more costly (i.e. for connection, usage) than for users in urban areas. For example, with call connections typically made to or content accessed from, major urban centres, distance-related charges are more likely to be incurred.

National targets for provision of a service superior to the Standard Telephone Service (STS) will invariably prescribe accessibility levels for less than 100 per cent of users.

report, Stage 2 - Emerging community change, Report to the Department of Public Works and Housing and Information Industries Branch, Queensland Government. Brisbane: QUT.

²⁴ Anecdotal evidence suggests that there is little or no statistical variation between the online user needs of rural and urban consumers. Ironically, urban communities could now be at a comparative disadvantage since they may lack much of the 'social capital' traditionally enjoyed by rural communities.

Table 1 illustrates how rural and remote users currently experience reduced access to various data transmission rates compared to urban and provincial users. The downloading of Web pages will therefore be significantly slower for the typical rural user.

Table 1: Network Coverage of various PSTN Data Transmission Rates

Transmission Rates	2.4 kb/s	9.6 kb/s	14.4 kb/s	28.8 kb/s
Urban (4.25 M) and Provincial (1.9 M) Users	99%	95%	85%	60%
Rural & Remote (1.1 M) Users	99%	70%	45%	30%

Source: *Digital Data Inquiry*. Australian Communications Authority, August 1998, ss 5.2.1 & 5.2.2; <http://www.aca.gov.au/publications/reports/digital/index.htm>

Government policies and plans for equitable availability of infrastructure to rural and regional areas were briefly reviewed. Requisite funding is currently sourced both ‘off-budget’ and ‘on-budget’, viz:

- The present Universal Service Obligation (USO) regime for STS delivery is funded on a cross-subsidy basis within the telecommunications industry;
- Regional Telecommunication Infrastructure Fund (RTIF)²⁵ and related initiatives are funded by the Government although actually dependent upon the partial sale of Telstra:
 - ◆ \$250 million initially to be spent under the original RTIF program, plus
 - ◆ an additional \$420 million arising from recent election promises.²⁶

The following points were made in discussing the above:

- Telstra’s recent claim²⁷ that the true cost of their USO amounts to \$1.8B raises questions about:
 - ◆ The validity of USO cost modelling and assumptions;
 - ◆ Design and administration of a USO regime to deliver both socially and politically desirable outcomes;
 - ◆ Competitive supply of services subject to the USO;

²⁵ Also known as ‘Networking the Nation’, refer to <http://www.dcita.gov.au> (accessed on 5/12/98)

²⁶ The Outline of the *Telstra (Transition to Full Private Ownership) 1998 Bill* details elements of the Federal Government’s social bonus (totalling \$421 million) that are set out in proposed Part 9 of the Telstra Corporation Act. This expenditure consists: of rural transaction centres (\$70 million over 5 years); extended access to untimed local calls (\$150 million over 3 years); meeting the telecommunications needs of people in remote island communities, isolated island communities or the Australian Antarctic Territory (\$20 million over 3 years); Internet access for people in rural or regional areas (\$36 million over 3 years); mobile phone coverage along highways (\$25 million over 3 years); a Television Fund to enable improved television reception, to extend coverage of SBS television, and to support a New Media Unit to be established within the SBS (\$120 million over 5 years). At: <http://www.aph.gov.au/parlinfo/billsnet/18316.doc> (accessed on 5/12/98).

²⁷ Telstra Press Release, 12 October 1998. *Telephone Subsidies Estimated to Cost \$1.8bn* At: <http://www.telstra.com.au/press/yr98/oct98/98101202.htm>. (accessed on 5/12/98).

- ◆ Alternative funding arrangements.
- Although initial RTIF funding tended to focus more on the provision of ‘hard’ infrastructure, later tranches (the most recent being announced in early December 1998) appear to be addressing the ‘softer’ aspects relating to infrastructure provision (such as identification of needs, administration, training, awareness raising, etc.).

Rural and regional communities differ markedly in size and economic viability. These range from an individual or family, to small and medium-sized towns with possibly fragile economies, and then to larger-sized communities with more robust economies. However, the lack of infrastructure bandwidth in certain communities should not always imply the necessity for government intervention.²⁸ Figure 3 illustrates how USO and RTIF funding either are, or should be, applied across such a range of communities.

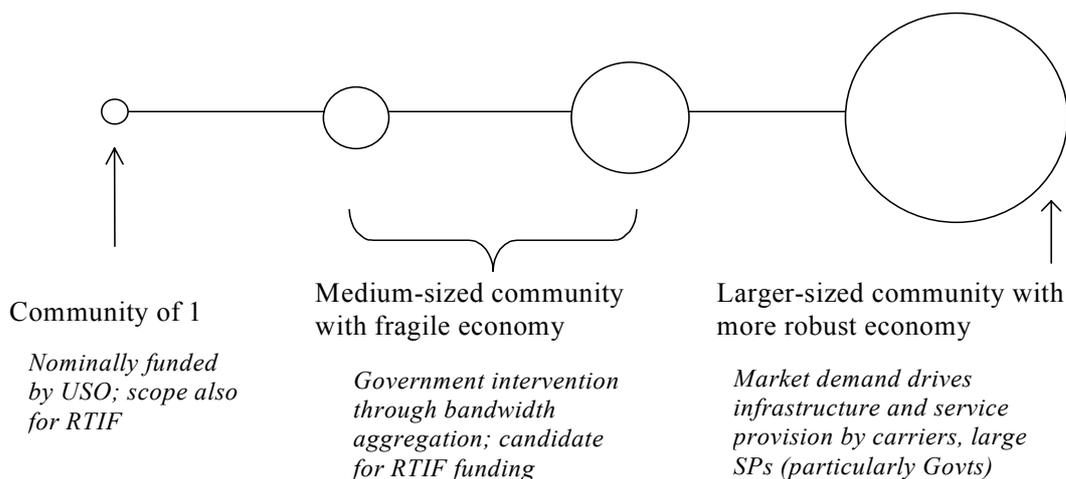


Figure 3: Infrastructure Funding Alternatives

It was concluded that the following matter deserved further attention:

A process should be established to address future infrastructure needs to keep pace with the demands of users, technological improvements and enhanced service delivery; as a subset issue, should future infrastructure in all rural and regional areas be created in advance of, or in response to, actual demand for services?

²⁸ Some regional economies are likely to fail regardless of the advent of online services and for others their demise may even be hastened. In some instances, greater bandwidth infrastructure could conceivably increase the likelihood of, for example, the closure of bank branches and their replacement by online services.

6. Conclusions

6.1 Post Forum Activities

The Forum participants are committed to applying the insights gained to their various domains. The following steps are also planned by CIRCIT at RMIT as a result of the Forum outcomes:

- Examination of prospects for a national design award for outstanding electronic commerce design and approaches to developing design skills in association with RMIT;
- Presentation of outcomes to groups such as the Australian Information Economy Advisory Council and Skills Taskforce; and
- Exploration of the issue of infrastructure, identified in the previous section, through future CIRCIT at RMIT research.

6.2 Issues For Further Attention

The Forum emphasised a number of outstanding issues requiring further exploration and debate:

- The right infrastructure needs to be in place.
What are appropriate strategies – market stimulation, infrastructure development programs/incentives, Universal Service Obligation, competition?
How can we ensure government delivers and follows through effectively on its programs for rural areas?
How can higher bandwidth for visual content be made available?
Who is monitoring what is happening?
- Marshalling Australia's human resources.
There are opportunities to harness the talents of youth who have high levels of expertise. Other groups with potential are the unemployed and the mature. How can we achieve benefits for them and the community in general?
- Developing a more collaborative culture.
The Forum identified critical needs for collaboration in the chain of development of online services. Australian businesses seem little disposed to collaborative activities. How do we make it happen?
- Building policies that are more user-centred.
How do we find a language which links the economic analysis of supply and demand, cost and price with user understanding of access and use, trust and meaning?
How can government and industry work with each other and with researchers towards enhancing trust and meaning via new communication channels?²⁹

²⁹ These questions are explored in Singh, S. and Slegers, C. (1998) *Small Business and Electronic Commerce* Policy Research Paper No. 44. Melbourne: CIRCIT at RMIT.

Attachment 1: Forum Participants

<p>Prof Trevor Barr Arts Faculty Swinburne University of Technology</p>	<p>Ms Dianne Northfield Research Fellow CIRCIT at RMIT</p>
<p>Prof John Bird Director John Bird & Associates</p>	<p>Mr Norm O'Doherty Special Adviser Australian Communications Authority</p>
<p>Ms Mara Bun Manager Policy and Public Affairs Australian Consumers Association</p>	<p>Mr Ian Peter Director Ian Peter & Associates</p>
<p>Mr John Burke Director CIRCIT at RMIT</p>	<p>Mr Martin Rowles Project Leader Office of Information & Communications Dept of Commerce & Trade, WA</p>
<p>Ms Pam Coutts Social Researcher Centre for Telecommunication Information Networking University of Adelaide</p>	<p>Ms Lyn Simpson Senior Lecturer School of Communication Queensland University of Technology</p>
<p>Ms Rachel Dixon Chief Executive Officer Handshake Media Pty Ltd</p>	<p>Dr Supriya Singh Principal Research Fellow CIRCIT at RMIT</p>
<p>Mr Phil Flaherty Manager Information Industries Task Force Dept Communication Information Technology and the Arts</p>	<p>Mr Phil Singleton Director & Principal Phil Singleton Research P/L</p>
<p>Prof Peter Gerrand Chief Executive Officer Melbourne IT</p>	<p>Ms Claudia Slegers Associate Research Fellow CIRCIT at RMIT</p>
<p>Prof Ashley Goldsworthy Executive Director Business/Higher Education Round Table</p>	<p>Dr Diane Sydenham Director IT & Multimedia Policy & Strategy Dept of State Development, Victoria</p>
<p>Dr Dallas Isaacs Education Services Manager Telstra</p>	<p>Mr Peter Jamieson Coordinator North East Telecentre Wangaratta</p>

Dr Bruce Tonkin Acting Director ANSPAG Monash University	Mr Ross Kelso Senior Research Fellow CIRCIT at RMIT
Mr Gerry White Chief Executive Officer Education.Au	Dr Graeme King Senior Manager Technical Regulation & Policy Nortel Australia
Mr Derek Whitehead Director State Library Victoria	Mr Neil McMasters Head of Department of Creative Media RMIT
Dr David Williamson Acting Leader Information Industries Task Force Dept of Communication Information Technology and the Arts	Mr Mark Needham Director Infrastructure Development Farmwide
Mr Russell Yardley Managing Director Acumen Multimedia Pty Ltd	

Attachment 2: Forum Model and Workgroup Approaches

The annual CIRCIT Policy Forum is an intensive three-day examination of an emerging policy topic related to information, communication and online services. Around 30 invited industry, government and community leaders and researchers gather and workshop the topic. The Forum provides a valuable alternative examination of policy and practice in the chosen area. The approach aims to yield new insights and some fresh suggestions for solutions. Forum participants and their organisations are listed in Attachment 1.

The approach comprises a combination of plenary sessions, smaller workgroup sessions and informal social activities to encourage networking. The workgroups, including an assigned moderator, are charged with producing a report of their discussion sessions with the aim of reaching ‘viewpoints’ on the issues around the Forum topic for joint consideration on the final day of the Forum.

Background Readings are provided to all participants in advance, and other CIRCIT research activity directly contributes to the Forum. Forum participants and the Reference Group³⁰ play a key role in the identification and development of background material. The Forum Agenda (in Attachment 3 of this report) and the focus of the workgroups are determined during the planning process through the Forum Reference Group.

Approaches Taken by the Three Workgroups

Electronic Commerce

While Workgroup discussion was ‘Net-centric’, it was recognised that consideration of design and use in the context of the Web raised issues relevant to other online mediums.

Two underlying themes shaped discussion:

1. A recognition that ‘we are all designers’ regardless of different vocations and daily activities. This translated to a view that cultural and attitudinal change is required to elevate the importance of generic design skills development across the population.
2. Conceptualising design in a holistic context which recognises the interrelated aspects of:
 - several stages in the design process – technical, interface development, content development and presentation of information, communication;
 - the importance of designing in the context of social, cultural, political, and economic environments; and
 - linking design to end-users and end-uses of services and applications, noting different requirements of business and community audiences.

³⁰ The 1998 Forum Reference Group comprised of the following members: Mark Arandale, Trevor Barr, Phil Flaherty, Peter Gerrand, Ashley Goldsworthy, Allan Horsley, Phil Singleton, Diane Sydenham, John Burke, Claudia Slegers, Dianne Northfield, Sarah Miller, and Supriya Singh.

There was also recognition that current debates are hindered by a lack of knowledge and data on the actual extent and characteristics of electronic commerce activities and users in Australia.

Discussion centred on four key areas – skills deficiencies in both the design and use of electronic commerce; identifying criteria for ‘good design’; factors enabling the development and use of electronic commerce in Australia; and suggested strategies to improve electronic commerce design and promote use.

New Media

Participants in the workgroup represented developers of interactive media, new media education, website designers, media policy and strategy developers, and user/cultural researchers. Issues relating to problems and suggested actions for new media industry development excited the most debate and as such are discussed at length in this report.

There was broad agreement that new media can be defined as:

- Products and processes arising from convergence of telecommunications, content/media and information technology
- A clash of the three cultures (information technology, telecommunications, and content) occurs because each has its own agenda and history, for example iconic representation versus text-based communication

The significance of the creative role of the artist or composer in new media content was recognised, in light of an otherwise general focus on the design of services and/or equipment and devices. This is discussed further in the section below, *Content and Media Development*.

At the outset, broad issues identified for workgroup discussion were:

- Perceptions of markets
- Content; audiences/users
- Functionality, process and technology

Why Has Convergence Occurred?

Before embarking on discussion of these broad issues, participants briefly examined why convergence has occurred, and came to the following conclusions, as illustrated in Figure 4.

The technological reasons are:

- Digitalisation
- Intelligence in networks
- Integration of software functionalities enabling media delivery over different mediums

And business reasons:

- Culture (alliances)

Why Convergence?

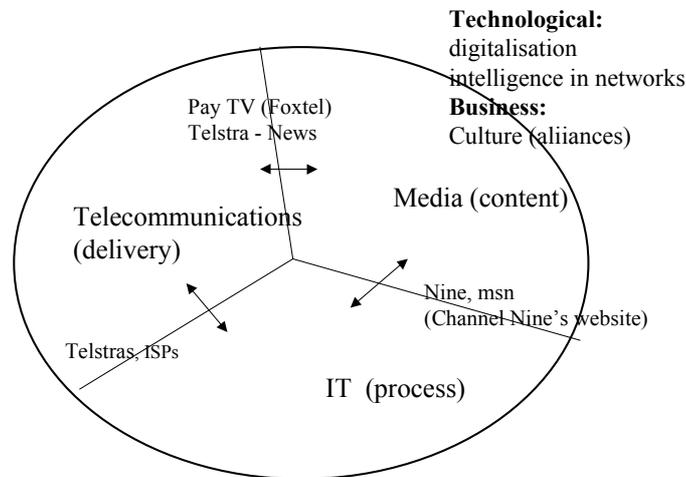


Figure 4: Defining New Media

Rural Australia

Participants in the workgroup represented developers and providers of interactive multimedia services and Web sites in particular, practitioners and researchers with field experience in online service delivery to rural and regional areas, and practitioners in telecommunications regulation and government policy setting.

Discussion centred on two main topics:

- a) The key components of a regional information economy and the threats and opportunities arising from online information and transactions.
- b) The adequacy of telecommunications infrastructure deployed in, or required, by rural and regional users and their communities;

At the outset the workgroup was challenged by the following, not totally accepted proposition, that acted as a catalyst for subsequent debate:

“Given that basic telecommunications infrastructure will shortly be in place, rural and regional communities should now focus on skill development and increasing awareness about online services and their opportunities.”

Attachment 3: Forum Agenda (summary)

Tuesday 17 November 1998

PM Participants arrive at venue
7:30pm Dinner (Introduction of participants)

Wednesday 18 November 1998

AM Plenary Session
Welcome and Overview of Activities
John Burke and Phil Singleton
Approach to Forum Outcomes
Phil Singleton
Presentations:
Three perspectives on connecting design and use
Peter Jamieson, North East Telecentre
Sarah Bloomer, Hiser Group
John Bird, John Bird and Associates
Workshop Groups:
Meet, introductions and overview agenda for group

PM Group activity
Dinner
Presentations: Strategic Approaches at National and State level

Thursday 19 November 1998

AM Brief overview of approach/issues
Workgroup Sessions:
Electronic Commerce
New media
Rural and Regional Australia

PM Workgroup Sessions as per above domains
Summary Plenary: workgroup facilitators present on insights; review approach to outcomes and propose agenda for final day sessions
Dinner

Friday 20 November 1998

AM

Workgroups briefly meet re agreed insights and outcomes

Final Plenary Session:

Review of outcomes from workgroups, summary and conclusion

Closing Lunch

1.30pm

Conclude

Attachment 4: Forum Background

Linking Design and Development of Information and Communication Services to Effective Use

Background

CIRCIT's 1998 Policy Forum aims to explore the potential for linking information and communication services (ICS) design and development activities to effective use of ICS in Australia. The Forum topic is designed to facilitate examination of demand and supply side issues.

In 1996 CIRCIT conducted a Policy Forum in association with the Aspen Institute, United States, on the topic: *Promoting competition in the converging information and communications industries: Will the Australian model deliver?* The focus of the 1997 Forum was on the demand side and examined Effective Use of Online Services: How can government, industry, business and community collaborate? Both Forums led to major CIRCIT research projects. *The Information Policy Maze: Global Experiences: National Responses* is a collaborative project between CIRCIT and the Program on Information Resources Policy, Harvard University, USA which has been ongoing since August 1996.³¹ Last year's Forum resulted in the project *Monitoring Australia's Progress Towards the Effective Use of Online Services* which has now developed a prototype website for review.³²

The Forum topic derives in part from the Information Industries Taskforce Report which stated that:

Australia must be a leading edge user *and* producer of information and communication technologies. Leading edge producers and leading edge users form mutually reinforcing relationships. Rarely does one exist in isolation from the other.³³

The strategic importance of promoting leading edge use has been recognised by a number of commentators.³⁴ Building internationally competitive, export oriented ICS sectors has long been a platform of industry policy. Various initiatives to promote ICS production, such as research and development (R&D) grants and the Cooperative Research Centre program, are in place. On the demand side, programs including the

³¹ Northfield, D. 1998, *The Information Policy Maze: Global Challenges - National Responses*, Draft, CIRCIT, Melbourne, June.

³² This website may be a useful point of reference for this Forum. It is located at: <http://www.circit.rmit.edu.au/monausol>

³³ Information Industries Taskforce. 1997, *The Global Information Economy: The Way Ahead*, Department of Industry, Science and Tourism, Executive Summary (italics added)

³⁴ Broadband Services Expert Group. 1994, *Networking Australia's Future: Final Report*, Canberra, AGPS; Department of Prime-Minister and Cabinet. 1995, *National Information Services Council: Agenda Papers*, first meeting of the Council, 10 August, Canberra AGPS; Northfield, D. Richardson, E. and Barr, T. 1996, *CIRCIT Policy Forum: Any to Any Forum Report*, August,; Information Policy Advisory Council. 1997, *A National Policy Framework for Structural Adjustment within the new "Commonwealth of Information"*, Commonwealth Department of Communications and the Arts, Canberra, July.

Regional Telecommunications Infrastructure Fund are encouraging a role for end-users in infrastructure and applications developments. The Internet is clearly offering opportunities for both suppliers and users of ICS. Is there a requirement for policy, industry and community initiatives to facilitate greater linkages between ICS designers and developers and end-users of ICS?

The development of the Forum has been supported by the Department of Industry, Science and Tourism (DIST), Nortel Australia, the Australian Telecommunications Users Group (ATUG), Melbourne IT and Multimedia Victoria.

2. Structuring the Forum

The structure of the Forum will evolve through interaction with participants and Reference Group members. The following key topics have been suggested.

- 1. Rural and Regional Australia**
- 2. Electronic Commerce**
- 3. New Media**

The Reference Group has emphasised the importance of viewing developments in these areas in the context of opportunities for Australia in the global marketplace.

The proposed approach is for workgroups to be structured around these broad categories as a basis for detailed discussion, consideration of opportunities and barriers, and identification of strategic actions by different stakeholder groups. Some areas that the workgroups may consider are outlined below.

2.1 Connecting Use, Design and Development

One approach to examining how ICS design and development activities may be linked with effective use is to better understand the interface between production and use. We can identify ways in which the supply side can work from production to design to end-user at the same time as the user or demand side works into the design interface and across to production as depicted in Figure 1.

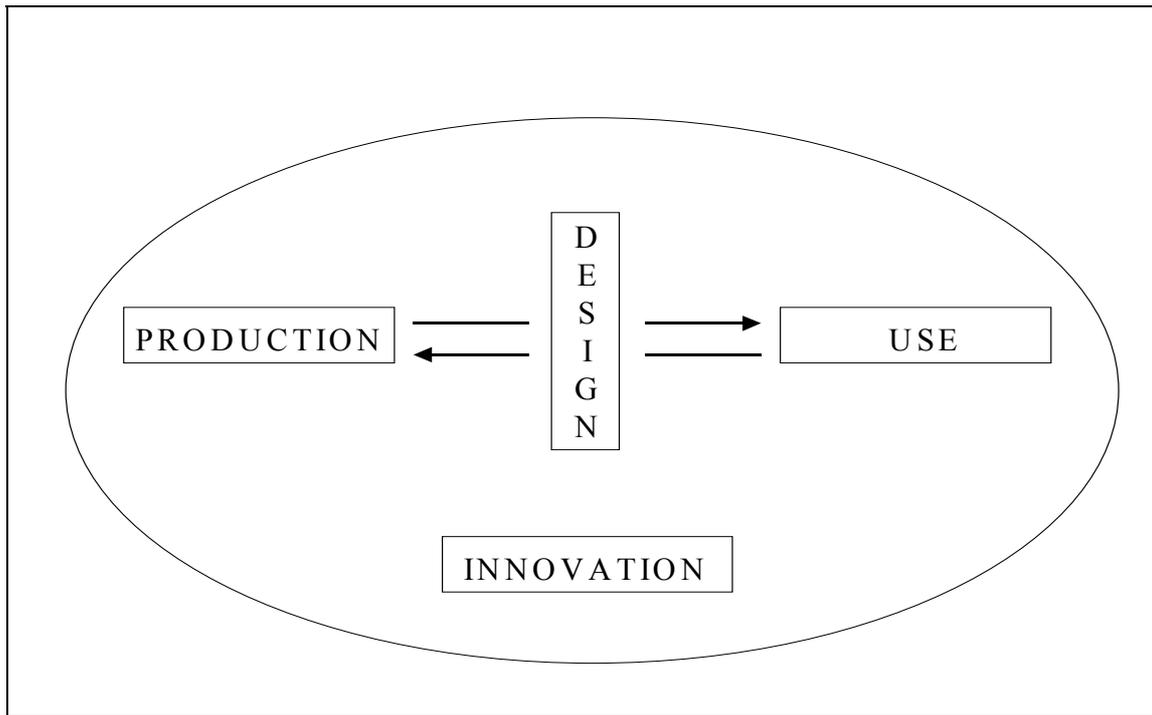


Figure 1: Understanding the Links between Use, Design and Production

Case studies will assist in considering attempts to connect use, design and development in different application areas. For example:

- The design of the MCIVER video-on-demand project by ANSPAG at Monash University highlighted the **importance of understanding the social context of use** of the service. The users were cinema students needing to access select copies of films, often at the same time from different campuses. The new service enabled simultaneous viewing of videos from different campuses and allowed pausing and on-screen note-taking at any point during viewing. However, during trials of the system, designers learned that some students are drawn to the comfort and privacy of home for watching videos. The viewing places available were limited to upright chairs in cubicles at the university and required a computer-like interface. It seemed that some students chose to continue taking the videos home, even if they had to wait a few days to get the video they wanted.
- In 1997 the Hiser Group developed a **toolkit for user interface design** of the ABS's Business Register, bringing users in as co-designers.³⁵ This attention to the planning and design stage of application development reduced the cost of later modifications, which are far more expensive to fix. Collaborative design workshops enable the rapid creation of screen designs for GUI applications. Each session involves a groups of users, developers and analysts who together design the interface of an application. Activity scenarios are narrative in style and are used to set and maintain focus on the context of use, with no direct mention of the technology initially. For example "Donald has received a request from a customer

³⁵ Bloomer, S. Croft, R. and Wright, L. 1997, Collaborative design workshops: a case study. In *Interactions*, January/February.

for a new order”. The scenario helps identify potential useability problems during design.

Various methodological approaches may be used in linking use to design and development. Participant observation and discussion with users at the interface as they work can provide **a contextualised approach to design** of new communication and information technologies.³⁶ This stems from the recognition that getting people to articulate what they do and require is difficult:

*Not only are developers building for users doing unfamiliar work but users themselves have difficulty saying what they do. People are adaptable and resourceful creatures – they invent a thousand work arounds and quick fixes to problems, and then forget that they invented the workaround... The users cannot say what they really do because it is unconscious – they do not reflect on it and cannot describe it. The defined policy for an organisation is no longer representative because it no longer reflects what is really going on.*³⁷

Contextual inquiry and design allows one to get data from users in context as they work on real activities in their workplace. The interviewer observes the user at work and can interrupt at any time and ask questions as an outsider such as “What are you doing now?” “Is that what you expected to happen?”

2.2 Industry Structure and Capability Issues

Key issues in positioning Australia as a leading designer and developer of ICS include:

- **Clarification of objectives in relation to industry development** – are we seeking to develop broad (and large scale) capabilities across manufacturing, content and distribution or should the focus be on specialisation and targeting of niche markets? Similarly, should the focus be on infrastructure and/or service developments?
- The government is **targeting electronic commerce and the Internet** as the key drivers of ICS development and use. Electronic commerce is clearly a priority issue for many stakeholders: a focus on electronic commerce is likely to support the development of solutions to broader problems affecting applications development in other areas, for example, privacy, security and interoperability issues. However, will the emphasis on electronic commerce be at the expense of other applications development and deployment? Conversely, is Australia drawing sufficiently on its leading experience in other areas, such as education and health applications development and use?
- A key element in building Australia’s R&D infrastructure relates to **skills development** within the information and communication industries. Noted ICS skills shortages relate to marketing and commercialisation expertise and technical skills in new media. The link between curricula development in educational institutions and industry based education and training has been supported by

³⁶ Holtzblatt, K.. and Beyer, H. 1993, ‘Making customer-centered design work for teams’. *Communications of the ACM*. Also accessed at: http://www.incent.com/papers.indx/Customer_Des_Teams.html (accessed on 1/4/98)

³⁷ *ibid*, p.2.

activities such as those of TITAB, although the nexus requires further development and extension to integrate end-user perspectives.

- **Does ownership matter?** – Branch office versus home grown developments. Industry policy in Australia has traditionally sought to attract transnational activities onshore with flow-ons, including technological developments, skilling and access to export markets, to local companies. Specific policy measures are also in place to support the growth of small-to-medium sized enterprises. The outcomes of such policies in terms of growing local and small companies have been less positive than expected and the Australian industry remains dominated by local offices of transnational corporations. Foreign and local companies remain focused on the domestic market. How much innovation is possible in this environment?
- How can **partnerships** between systems developers, ICS companies and end-users be harnessed to promote intellectual property and export returns to Australia?
- What are examples of, and opportunities for, **developers to target leading customers** of ICS to support the design, development and effective use of ICS?
- **What is the role of trial activities**, including business incubators, in promoting both innovation and use of ICS and in providing a bridge between developers and users?

2.3 Government Policy and Facilitation

Government has a key role in the development of Australia's research and development (R&D) infrastructure, in the interests of both supporting industry development and providing benefits to business users and consumers. Areas for discussion may include:

- With so called 'convergence' and growing recognition of the importance of content and software development, there are arguments supporting the **extension of coverage of existing programs** (i.e. R&D tax concession, sources of financing and intellectual property arrangements) across all ICS sectors and players, regardless of their size and activities in traditional and/or new media sectors. Re-examination of the balance of support by governments and within organisations for research versus design and development activities is a related issue.
- What is the **role of Federal and State Governments** in:
 - ◆ Ensuring that adequate and appropriate ICS education and training options are available in Australia?
 - ◆ Encouraging the entry of students, including women, to ICS related fields of research?
 - ◆ Retaining post-study expertise in Australia?
- Skilling issues also relate to **end-users and their awareness of service options** and their ability to access and use ICS. A government role in public education campaigns is developing through initiatives supported by NOIE and DIST and there is scope for greater coordination between government-initiated activities and the roles of user groups such as ATUG and CTN in raising public awareness and informing constituents.

- **What is the potential for collaborative activities across governments, the ICS industry and users**, and who should be responsible for identifying and facilitating such opportunities?
- What is the **role of government funding** and what forms should it take – purchasing/contracting, grants and incentives, support of venture capital development, seed funding, matched funding? What can we learn from experiences with funding programs to date i.e. RTIF and DIST business online programs?
- What are the **policy and regulatory requirements to support content developers**, and end-users as content developers. Will the lifting of access restrictions and co-regulation be adequate in providing content developers with sufficient access to distribution channels and appropriate rewards and intellectual property protection?

3. Outcomes

The Forum is part of a process of engagement and dissemination. A focus on outcomes will be a continuing aspect of this process. Key issues will be summarised in a Forum Report, contributed to and reviewed by all participants.

In the final session of the Forum, the focus will be on clarifying outcomes emerging from the workgroup sessions, looking particularly to common areas. While the exact nature of these outcomes discussions will depend on workgroup considerations, possible areas include:

- Supporting approaches to user needs driving policy and shaping the design of ICS;
- Supporting approaches to stimulating takeup of new services;
- Developing skills in design of services and applications;
- Positioning Australia in the global marketplace as a centre of excellence in design and use of new services.

These considerations may be referenced to the National Information Economy Strategy or other points of industry and policy development.

Attachment 5: Connecting Use and Design of Information and Communication Services

Key issues that have emerged in the initial consideration of the forum topic include:

- How can our understandings of use and its social context contribute to the design and development of ICS? This could include a focus on global users.
- How do we stimulate the use of services that have been developed?
- How do we retain a critical mass of skilled designers and developers in the ICS industries?
- Other steps in developing Australia's research and development infrastructure

These issues and related reading material are discussed in the following pages, followed by a list of readings and the reading material.

Connecting Use and Design of ICS

One approach to examining the link is to better understand the interface between production and use. We can identify ways in which the supply side can work from production, to design, to end-user at the same time as the user or demand side works into the design interface and across to production as depicted in Figure 1.

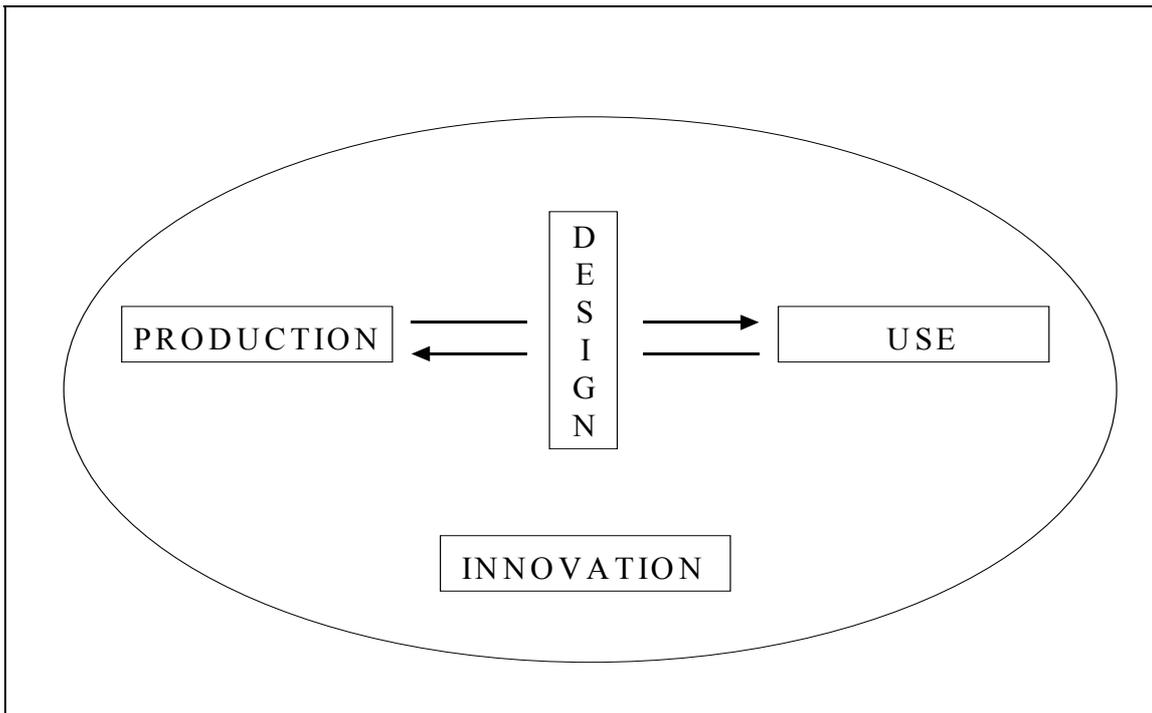


Figure 1: Understanding the Links between Use, Design and Production

The design activity may operate at various levels, including:

- The design of equipment and services
- The design of the applications-related interface to users
- The design of systems and processes utilising ICS, at an organisational or broader societal level.

How can our understandings of use and its social context contribute to the design of ICS?

This may be explored in various ways:

- Understanding the social context that shapes use for example, the workplace, the family, the small business. This knowledge can feed into the design process, and focuses on peoples' activities, such as shopping and learning, rather than on technologies.
- Improving the useability of the service by consulting user and considering their needs during the design process and evaluating services already in place: user centred design

Some case studies and approaches, which take one or both of the above approaches to connecting use and design, are outlined below.

- Sarah Bloomer and the HISER group use a range of user-centred design methods for developing user interfaces: participant observation of users at work. These include collaborative design workshops using workplace activity scenarios and paper mock-ups with users, developers and analysts; and evaluation and refinement of the interface to make sure it is useable. (Sarah's paper *Applying User Centred Design to Electronic Commerce* was distributed to the participants.)
- Schofield and Flute's report *Use and Usability* is a guide for setting up and designing public-facing interactive multimedia systems such as information kiosks, Internet sites, and Interactive Voice Response sites. Its focus is on interface design and what makes people comfortable using these systems. Taking into account the myriad of possible users, such as the visually impaired and elderly, it examines what design questions need to be asked: *Will the user be standing up at the Unit? Is privacy an issue? What are the lighting conditions?*
- Supriya Singh examines the social context that shapes use of the Internet for money management and shopping, and its implications for designers of online banking and payments services. Singh also explores the requirements of diverse cultures and markets in her paper *Gender, Design and Internet Commerce: A Reflection on the Australian Experience*.
- The CIRCIT study *Small Business and Electronic Commerce* explores why a business person chooses one channel to communicate for one activity and another channel for another activity. Reporting on findings from qualitative and quantitative studies, the paper explores desired characteristics of communication channels for particular activities, such as record, personal communication, unobtrusiveness and speed.
- The concept of "effective use" was introduced at the 1997 CIRCIT Policy Forum and has subsequently been developed in the feasibility study of monitoring Australia's progress towards effective use of online services. Effective use is seen to entail value to key stakeholders – users, content service providers and

communications service providers. Designing for effective use takes us into areas of the appropriate form of online services for different activities, and particularly the ways in which barriers to effective use are to be addressed. The CIRCIT report on *Australia's Progress Towards Effective Use of Online Services* can be accessed at: <http://www.circit.rmit.edu.au/monausol/>

Stimulating use

Generating the use of services, which have been developed, is a major government priority. It is discussed in the DIST report *Getting Business Online*, where key strategies are identification of those groups and businesses most likely to benefit from existing technologies, and awareness-raising and skilling programs.

A government role in public education campaigns is developing through initiatives supported by NOIE and DIST and there is scope for greater coordination between government-initiated activities and the roles of user groups such as ATUG and CTN in raising public awareness and informing constituents.

The CIRCIT report *Government Approaches to Stimulating the Uptake of New Online Services* examines various ways national governments have sought to accelerate the uptake of services within the community. Core approaches include: creating the right regulatory environment to ensure both the availability and affordability of new ICS; developing an understanding of demand to ensure that these services are meeting user expectations and needs, providing access, and supporting the development of applications through trials.

Skills Development Within the ICS Industries

How does Australia get and keep a critical mass of skilled developers and designers? Is there a lack of training and skills in user interface design? The particular issues here seem to be:

- Clarifying the kinds of skills required and the current gaps in their availability. The AIIA reports *IT&T Workforce Gap Hurts Australia's Future* and *Demand for Skilled People in the IT&T Industry Toward the Year 2000* help identify these gaps. Noted ICS skills shortages relate to network integration, human computer interface design, and marketing and commercialisation expertise. The link between curricula development in educational institutions and industry based education and training has been supported by activities such as those of TITAB. Although the nexus requires further development and extension to integrate end-user perspectives.

The role of Federal and State Governments in:

- Ensuring adequate and appropriate ICS education and training options are available in Australia
- Encouraging the entry of students, including women, to ICS related fields of research
- Retaining post-study expertise in Australia

Other Steps in Developing Australia's Research and Development Infrastructure

Government has a key role in the development of Australia's research and development (R&D) infrastructure, in the interests of both supporting industry development and providing benefits to business users and consumers.

With so called 'convergence' and growing recognition of the importance of content and software development, there are arguments for supporting the extension of coverage of existing programs (for example R&D tax concession, sources of finance...) across all ICS sectors and players regardless of their size and activities in traditional and/or new media sectors.

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