Flexible Packaging of Training Packages

Investigative Research Report into making ICT-related Training Packages more flexible and relevant to young people

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Flexible Packaging of Technology Training Packages
Executive Summary

This is an investigative report into how to make the packaging and design of Training Packages more flexible. Specifically, how to identify and test possible approaches to more flexible packaging and design of existing "technology-based" Training Packages and qualifications under Innovation and Business Skills Australia’s (IBSA) management.

The rationale for this work is to create more effective linkages with pre-vocational programs so as to meet the needs of younger learners with potential to become entrants into technology-related industries that include information technology (IT), telecommunications, broadcasting, multimedia, printing and graphic design.

The consequences of the rapid development in information and communication technology (ICT) have been profound. Many of us have had our lives and our jobs profoundly altered by the change to existing technologies and the emergence of new ones. We now can access large quantities of information quickly, using a range of technologies, and in locations now enabled by new and converged mobile networks.

How does it affect the design of Training Packages? And what does that mean for young people? And ultimately how does it affect the retention of young people—particularly 14 to 19 year olds and Years 11 and 12 students—into learning and careers pathways that are addressed by ICT-related Training Packages?

Figure 1 - Model of Investigation

To answer the complex questions raised, this investigation will have to traverse a number of related fields of study. The above model of investigation confirms the dimensions and the main areas for investigation. To make findings on how IBSA’s
technology-related Training Packages can be made more flexible and better engage the interests of young people, the authors split their study into four main dimensions. The separation of the study into four dimensions does not diminish the ability to make findings that span all areas. For instance, core findings that show how well Australia can compete in global markets is directly related to the effort to significantly improve the ICT skills of young people. Investigation will also show how the level of innovation and creativity that shapes the competitiveness of Australia’s ICT industry is directly related to this topic of study.

But the most important findings made in this report will centre on what we now know about young people. For the first time in Australia, this investigation gives insight into Australian 14-19 year olds as digital natives and uncovers some of the implications this holds for teaching technology-related vocational education and training.

Over 15 years ago Marc Prensky predicted we would see “digital natives” emerge. These were the students that would change so radically through access to technology that they would no longer be the “people our educational system was designed to teach” (2001:1). Digital natives are distinguishable from others – especially parents, employers and teachers - who may use the technologies and networks as ‘digital immigrants’. While a term the authors would not choose to use digital immigrants does highlight the difference between digital natives and those adults that cannot think and act in a manner only immersion in digital technology at a very early age can bring.

Use of the term digital native is a deliberate move away from what John Seeley Brown (2002) and Don Tapscott (2006) popularly called the Net or Digital Generation. The investigation has shown young people in Australia are moving beyond the computer and its connection to the Internet. Digital natives are a generation who have grown up using the Internet and new media devices.

The evolution of technology and the emergence of digital natives have wide-ranging implications for ICT-related Training Packages and their qualifications and competencies. The investigation therefore studied the impact on four of the most important Training Packages in the Australian system:

- CUF07 Screen and Media Training Package and specifically broadcasting and media, including interactive digital media and animation as part of studies in screen;
- ICA05 Information and Communications Technology Training Package and specifically information technology (IT) and computing;
- ICT02 Telecommunications Training Package and telecommunications; and
- ICP05 Printing and Graphic Arts Training Package and particularly general approaches to printing and graphic art, desktop publishing, and multimedia

This investigation shows implications resulting from:

- the impact on relevance of current content and resulting pedagogy given emerging technologies, particularly Web 2.0 technologies, and the behaviours of young people who increasingly use them in every aspect of their lives.
- ICT-related occupations emerging, evolving, and merging across occupational industry boundaries to reshape the requirements for employment and possible career pathways.
• ICT increasingly underpinning all aspects of work, life and areas of education to the extent that teaching young people to just use technology ignores the social and personal context within which the learning experience needs to be positioned.

• Pressures on schools to keep pace with change and to resource not only relevant learning and associated infrastructure, but the professional development of the teachers required to make applied ICT learning meaningful and engaging.

The Investigative Research Report synthesises research, examination of recent global and national reports and feedback from practitioners into a set of principles and findings as to the design of Training Packages and a set of options for a qualification able to span technology, media and communication technology.

Summary of principles

For educators, the implications arising from the use of technology by young people has been well known but poorly understood. This is such a multi-dimensional issue. Study on any one aspect of the matters covered in this report – ICT, use of technology by young people, technology availability, teaching technology subjects – cannot be done without trespassing into other, related matters. The myriad of research, reports and data available did not uncover any firm strategy teachers could use to best structure courses in ICT that are based on Training Packages.

Resulting from the investigation, eleven principles emerged that were considered essential considerations in any effort to improve student engagement in ICT vocational learning based on Training Packages (Chapter 10). The principles and their interdependencies require further research.

Principle 1: Build a systematic approach to professional development with a specialisation in ICT teaching in a VET subject.

Principle 2: Encourage social interaction

Principle 3: Make ICT learning meaningful and more interesting.

Principle 4: Control of the learning process needs to be shared.

Principle 5: Accessible and anywhere with the caveat that teachers cannot be regulators of behaviour outside the classroom.

Principle 6: Let students generate their own content and personalise how they access content.

Principle 7: The digital natives will become more restless unless their evolving learning styles and learning preferences are incorporated into teaching practices in ICT subjects

Principle 8: Assessment should add value.

Principle 9: Encourage creativity and innovation.

Principle 10: Ensure Training Package-based ICT qualifications and competencies set the foundations for employment while not narrowing competence to technologies and careers that will become obsolete.

Principle 11: Competencies need to improve employability while opening pathways to current and future ICT careers in many industries.
Summary of findings

The findings that are made represent a synthesis of what the investigative research has uncovered in relation to the digital landscape in Australia and how young people are engaging with ICT in life and at school. The findings are intended to initiate debate within the VET practitioner and policy maker communities as to how ICT learning based on Training Package qualifications and competencies can better engage young people.

Finding 1: The way Training Packages are designed and reviewed is not conducive to promoting entry-level applied ICT vocational education and training that is responsive to change.

Finding 2: The information contained in the ‘Technology’ section of employability skills has little real relevance.

Finding 3: Requirements for students to choose a career pathway and specialisation in Year 10 before undertaking prevocational or Certificate I to III qualifications in Years 11 and 12 is counterproductive to a sustainable approach to making young people more employable.

Finding 4: ICT-related Training Packages need to be reviewed to establish whether competencies relating to technology use that were seen as entry-level requirements 2-5 years ago have become skills and knowledge young people typically acquire by the age of 15 and therefore place no value on as part of post-compulsory education.

Finding 5: To promote retention, pathways into further ICT-related work and careers, common competencies need to be identified across the Training Packages.

Finding 6: Technical teachers delivering ICT-related qualifications in schools need support materials, especially with respect to assessment.

Finding 7: To an employer, competence in the use of ICT is not the sole determinant of ‘employability’.

Finding 8: To a digital native, immersion and competence in the use of ICT is not a precursor to a career in ICT.

Finding 9: Show industry support and the legitimacy of career pathways through the use of brands.

Options and a model for a more flexible and relevant entry-level ICT-related suite of qualifications

The findings and design principles listed above were used to build three options proposed for making ICT-related Training Packages more effective for young people, especially those in Years 11 and 12 VET in school and applied learning streams.

There is an implicit assumption here that what is done in ICT teaching and training at Years 11 and 12 (or earlier actually) will impact on the achievement of our objectives in mainstream VET learning implementation.

Doing nothing is not presented as an option.
Option 1: Improve the existing Training Packages and qualifications
Under this option, the principles, findings and overall research and feedback from teachers would be utilised to improve what currently exists. This option is likely to cause the least disruption.

Option 2: Add a cross-industry ICT-specific suite of qualifications
This option would result in a purpose-designed Certificate I and II, and perhaps Certificate III, which would address cross-industry entry into ICT-related industries and occupations. Certificates could be titled ‘Information, Media and Technology’. The proposed qualifications would be in addition to what exists now. The qualifications would prepare students for entry into a broad range of career pathways spanning ICA05, ICT02, ICP05 and CUF07 Training Packages.

Option 3: Add an applied learning suite of qualifications
Option three is the most disruptive and would involve a moving away from standard approaches and practices inculcated into the existing Training Packages. While all competencies and materials can be authored and endorsed consistent with national requirements neither the competencies nor the resulting qualification would be tied to an industry or a defined vocational pathway linked to an occupation or job family. However, the competencies would be written and sorted to support the Employability Skills Framework and to cover the three critical aspects of technological knowledge: social, personal and applied knowledge dimensions. The dedicated emphasis would be on preparing young people for a career in ICT that would span all existing ICT-related Training Packages.

This possible qualification, and other complementary national activities needed to enable successful implementation, are depicted in the diagram below.

Figure 2 – Structure and enabling activities supporting a proposed Certificate I and II in Information, media and communication technology
The Project Brief for the Flexible Packaging of Technology Training Packages

The objective of this research project is to identify and test possible approaches to more flexible packaging and design of existing “technology-based” Training Packages and qualifications under Innovation and Business Skills Australia’s (IBSA) management. The rationale for this work is to create more effective linkages with pre-vocational programs to more effectively meet the needs of younger learners with potential to become entrants into technology-related industries.

Over recent years there has been a steady decline in enrolments in IT qualifications. The ICT industry is also experiencing difficulties in engaging young people in lower level telecommunications “feeder” skilling that leads into Industry Pathways. Confusion at the multiple lower level qualifications across up to 5 Training Packages contesting this young cohort of potential learners is adding to the problem. Training Package qualifications and skill frameworks based on "old assumptions" may also be a deterrent to young people.

Project outline and scope
IBSA proposes a research project to identify options for incorporating flexibility into the design of our technology-related Training Packages (both individually and collectively) to more effectively accommodate cross-technology familiarisation and skills formation. By building in more effective linkages with pre-existing VCAL, VET in schools or other pre-vocational programs, IBSA believes that the outcomes of this project could deliver benefits through:

- Engaging the interest of young learners across new and emerging technologies;
- Introducing and developing more broadly based technical skills;
- Identifying more options for future vocational and occupational pathways; and ultimately,
- Providing recognised credentials and credits for further training.

IBSA has been exploring the opportunity for merging a number of its technology-related qualifications and Training Packages (information technology, telecommunications, broadcast technology and even components of printing) with a vision of a broader technological skills base and improved clarity around career and training pathways and choices. This approach has been investigated as a response to greater occupational convergence within our workforces, which in turn is characterised by a mix of “hardware”, “software” and production components across many of IBSA’s industries. The ever-expanding digital economy and the expansion of broadband and wireless technology services and products globally provide further impetus to build a youthful, technologically-savvy workforce. Demand for these services and products is underpinned by Government and business imperatives to ensure better competitiveness within the global economy and to provide better and more affordable services to consumers.

Project Outcomes/Deliverables
By investigating the common components of existing technology-oriented Training Packages and qualifications and considering options for package and qualifications re-design, it is expected that IBSA’s research will result in several “model” qualifications characterised by:
• a robust technology foundation for further career specialisation, with credits towards further qualifications;
• a foundation and pathway for meeting the cross-industry needs of entry level technology trainees and recruits in an ever changing technological, business and social environment;
• strengthening of the links between the VCAL, VET in Schools and technology-based Training Package qualifications; and
• provision of a broader skills base and flexible approach that will better service all industries that use enabling technologies such as information technology and telecommunications

Two by-products could also result from this analysis:

1. Potential for improved engagement of females in Years 11 and 12 which in turn could assist in contributing to gender balancing in those technology sector workforces not covered by traditional trade programs, as well as potentially increasing the supply of young people. It is well known that there are a number of factors which are critical to female participation in non-traditional occupations, one of which is the opportunity to explore technical fields in a supportive and educative environment.

2. An acknowledgement of the potential provided by the use of technology that currently surrounds and underpins secondary students’ social environments (Skype, Facebook, iPods, wireless, MSN), contemporary working environment (new technologies like RFID’s) and other components of student life (laptops, software programs, desktops, mobiles) in their capacity to link and bridge to the information technology, telecommunications and broadcast technology Training Package qualifications and competencies. The use of these facilities as platforms for applied learning within the design of units, qualifications and Training Packages would recognise the importance of:
   • knowledge that individuals can bring to the learning environment;
   • media for sharing of knowledge;
   • opportunities for discussion on flexible content of programs with students;
   • integration of learning into real life situations; and,
   • flexibility to meet emerging skill and knowledge requirements.
Study methodology

This is an investigative research report. Our approach in this report has focused on the analysis and categorisation of data in order to ultimately identify ‘core concepts’ around which we can better understand the topic and to make findings that inform current practice and assist with the formation of a theory upon which later research can draw.

**Figure 3 – Flexible Training Packages project investigative process**

The study evolved through four distinct phases:

**Phase one** involved research and literature analysis and identification of lead authors and major findings from publications and reports on the topic.

**Phase two** involved consolidating the data and comparing and contrasting it across studies. This focused quantitative data on the use of ICT in the Australia ‘landscape’ and later confirmed usage patterns of young people.

**Phase three** in the process moved from investigation to establishing some principles could complement findings or useful insights for those later, more in depth research.

During Phase 3, and on commencement of Phase 4, initial findings were tested for qualitative relevance with a small sample of classroom practitioners and experts in the field. Through interviews and direct questioning the authors sought to get an initial sense of how well the research held resonance with what was occurring in schools.
Phase four involved developing a model for improving the flexibility of ICT-related Training Packages while making them more attuned to how young people will engage in related qualifications and careers pathways.
1. Introduction

Our children are not passive users of technology. Their status as users has a current and future impact on business, society and our economic success. Insufficient technical competence in the workforce can hinder economic growth. Yet educators struggle to respond to the rapidly changing landscape that is marked by both changes to technology and changes to how young people learn in the classroom and respond to technology outside the classroom.

This report has real context in today’s world. One of the authors, shares a computer work area with his 15 year old son, Callum. Callum was completing his home work using the wireless connected laptop, responding to SMS messages from friends with one hand while connecting with other friends using Microsoft Instant Messenger. He does it all seamlessly and manages to browse the Internet to source data for his assignment and have the latest music compilation running off his iPod. While the World Wide Web is vast, he filters and selectively engages with it in a highly personal way; see the image below by his younger sister on what ‘Callum’s virtual world’ looks like.

Callum is two years younger than his elder sister. While his sister will use these technologies at the same age she would have been anchored to the PC playing music and predominantly communicating with friends using the Internet. The elder daughter is from the Net Generation (John Seeley Brown, 2002; & Tapscott, 2003 & 2006) but Callum is a true representation of a digital native (Prensky 2001:1; Tapscott, 2009). The Net is no longer a lifeline tied to a fixed Internet connection or a PC. As a digital native he is immersed in the use of information, media and communication technologies. He will multi-task at high speed, completing standard activities using different technologies while seeking new sensations.

Our children are being shaped by the digital age. The technology they use without thinking shapes the way they think and how they act and interact. But our children are reshaping the age within which they live in a far more immediate manner that past generations. In Australia and many developed countries we have young people better equipped and skilled than most adults to master technology and how it is deployed to affect their lives. Our kids are not just users of technology at home and in school, they are consumers. They influence technology through what they buy and they don’t talk about listening to music, social networking, or browsing; they talk in brands, they are using the iPod, Googling something, or Facebooking someone. Brands become icons and icons represent commercial success. Ultimately it is commercial success that drives investment by companies in technology innovation.

The accelerated adoption of wireless technology, and in particular mobile phones and computing devices (smart phones, iPhones, etc.), has seen the next generation of young people in Australia (8-14 year olds) move beyond the use of personal computers and intermediate technologies such as Internet enabled gaming consoles and satellite TV. The previous ‘generation’ of now 14-24 year have evolved with technological developments. As the previous Net Generation these young Australians have moved to become digital natives. While not as seamless as 8-14 year olds, this generation has come to use information and communication technology (ICT) as a tool because its evolution has kept pace with what they want to do.
Figure 4 - Callum’s interactions and personal view of the Wide Web

(C) Rhyannon Bowles 2009
Generations aged over 24 years of age may engage with the technology, or even drive its evolution, but we think and behave in ways that have not been shaped through immersion in digital technology. We can be digital immigrants (Prensky, 2001), effectively using ICT. But deep down we are still fascinated by technology and can compare how we do things now with what it used to be like before technology enablement.

But the immersion in digital technologies does not mean young people change how they do all activities. To most young people technology is just a tool. Callum’s world above was draw by his sister freehand not because she could not use a computer application but because, “I like the feel of drawing and the raw look when it is done”.

It is in this complex environment that we have been examining how ICT-related Training Packages can be made more flexible and more engaging for young people. To answer this question we have to better understand young people and their use of ICT. We have to investigate the network of relationships between young people, their everyday use of technology, its impacts on teaching and learning, and finally comment on how well Training Packages designed by digital immigrants mainly raised in a world dominated by industrial age thinking may usefully be improved.

Any study of ICT and Training Packages for young people falls against a wider backdrop where they are undertaking transition to pathways that hopefully lead from compulsory to further post-compulsory education and training, or to work. Decisions on learning and subject choices will profoundly affect their lives. Such decisions and the factors affecting them will naturally extend well beyond what can be encompassed in this report.

Figure 5 - Model of investigation

As depicted above our approach to this investigative research report will:

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• Place the study in the context of wider ICT developments, economic impact and status in households of Australia.

• Review current usage patterns of ICT by young people and provide an analysis on how this may affect engagement in learning and careers linked to ICT-based Training Packages

• Examine barriers and issues affecting teachers currently delivering ICT-related subjects in School. This study will lead to a list of principles that can guide further research and action with regards both the design Training Package-based ICT subjects in school and improve students’ engagement in a learning process that actually promotes ICT as a viable career pathway.

• Reconceptualise how Training Packages and thence educators may better overcome constraints and leverage the interests of digital natives and emerging technologies in a meaningful way. This will also involve comment on how a broader approach to qualifications and competencies will improve the future vocational and occupational pathways available to students.

• Outline for a ‘strawman model’ for a VET or applied learning ICT qualification that could provide a coherent progression route for young people ‘at risk’ of not moving into further work or learning. The qualification(s) should confirm the competencies that could lead to raise employability skills and career pathways across the ICT Training Packages.

The resulting principles and findings on how to make ICT-related Training Packages and vocational education and training delivery more flexible are based on substantive research and assessment of the literature. Nevertheless our understanding forged by this research in this report must be considered the foundation for more detailed understandings to be developed.

1.1 Parameters for the investigative research

1.1.1 Defining young people for the purposes of this study

This study is primarily chartered to examine how Training Packages dealing with information, media and telecommunication technology can more effectively meet the needs of young people. The primary focus being on Year 11 and 12 and students completing vocational education and training (VET) in schools or pre-vocational programmes.

The primary age group being examined in this study will be 14-19 year olds. However, analysis will examine data applicable to 10 to 24 year olds in Australia. This is to gain some perspective on the students who may eventually choose to undertake studies within IBSA Training Packages, as well as those who may already be doing so.

The population of this age group, as part of Australia’s overall population, are shown in the chart below. Except for the 1960 to 1980 period where the population of 10-24 year olds rose to over 26% of the total population, the comparative proportion of 10-24 year olds of the total population has remained steady at around 20%. Australia’s population is aging, so in 2007 while 10-24 year olds make up one in five Australians. The proportion of people aged under 15 years is projected to decrease from 19% in 2007 to between 15% and 18% in 2056 (Series C and A respectively) and to between 14% and 17% in 2101 (ABS, 2008f).
As of May 2008 there were 1,110,700, 15-19 year olds and 568,700, 20-24 year olds participating in education and training in Australia (ABS, 2008h).

Figure 7 – Australian 15-19 year olds participation in learning and the labour market, May 2008 (ABS, 2008e; ABS 2009:19; ABS 2008h)
The figure above provides an insight into the involvement of 14-19 year olds in learning and work. We have classified all 16-19 year olds in the Australia population at May 2008, along two dimensions. Firstly, whether they are in learning and whether this is full-time or part-time learning. This is further broken down to indicate the level of learning. The second dimension is participation in the labour market. In this dimension they may be working full or part time, unemployed or they are economically inactive (neither in work or learning but not registered as unemployed). Note that young people may be counted more than once. They could be in work but also completing study. For instance we know from that in May 2008, 387,100 15-19 year olds engaged in learning also worked part-time (ABS, 2008e).

The core outcome from this investigative research report will be to contribute to strategies that aim to ensure more 15-19 year olds are engaged in learning or work.

1.1.2 Defining technology for the purposes of this study

One of the defining parameters for this study is how to improve the flexibility of Training Packages that cover ‘technology’. The broad definition of ‘technology’ and Training Packages would encompass a huge canvass for investigation. This study will investigate technology as it applies to information, media, telecommunications, and communications technology. In this sense technology applies to competencies and qualifications that relate to Information and Communication Technology (ICT).

Nevertheless, the definitional basis used to define the parameters of ICT will not be narrow. The Information-Communication-Technology will not be isolated into components that just deal with telecommunication networks, digital media, online environments or computer-based information technology. Information is now conveyed in digital form. This means digital media and how we store, access, share, and produce such digital artefacts are included in our scope of investigation. Not all ICT involves the use of computers or the Internet. With convergence of ‘old’ and ‘emerging’ technologies, a broad definition of ICT can and should encompass technologies such as CD and DVD players, radios, and televisions. Equally, new ICT applications and hardware continue to emerge.

ICT is not just composed of technological entities (e.g. a phone, a computer, a network cable). It could be component technology embedded in other technologies (e.g. a DVD player in a car, a hard disk drive in a gaming console, a network switch on a printer), or be an application able to be used on multiple platforms (e.g. a Global Positioning Systems - GPS).

ICT explicitly includes ‘digital’ or ‘interactive’ media. The term new media is used herein to describe how traditional media, such as books, television, and radio, are converging with digital media; particularly interactive media and media for social communication (MacArthur Foundation, 2008:8).

Nowhere is this mosaic of ICT and the convergence of different technologies and media more apparent than when we examine The Web.

1.1.3 The World Wide Web and the Internet

The advent of the World Wide Web (WWW, or the Web) in 1992 permitted data, documents, menus and indices to be represented to the users in an accessible environment. With the emergence of the Web came the Internet a public, global network accessible to anyone with access to an Internet connection and the capability to browse the Web. While symbiotic, the Web and the Internet are not the
same. In crude terms, the Internet is the network that forms the basis for ‘global’ connectivity while the Web is the graphical, easy-to-access information system.

At the end February 2009, more than 1.6 billion people globally were using the Internet 8 (Internet World Statistics and Nielsen-online.com) to access trillion web pages! (Google Statistics, 27 February 2009). The speed of change has not only been profound but it continues to accelerate.

**Figure 8 - Computers rapidly becoming faster and more powerful**


(OECD, 2008b:1)

The advent of mobile and wireless connections has fostered a shift in how people and businesses can communicate and learn. Access to the Internet had been dominated in the decade leading up to the twenty-first century by those using ‘fixed’ terrestrial ‘phone connections. However this has changed; now some 30 percent of global users access the Internet by other means such as satellite, wireless or mobile devices. The access to the Internet via new technologies, including mobile and wireless, has seen worldwide Internet traffic (actual use of the Internet by users) double between 1998 and 2002, and global traffic on all networks is expected to double again by 2011 (OECD 2008a: 249).

### 1.2 The relationships between learning and ICT

There are a number of relationships between ICT and learning. In order to clearly identify what this investigation will cover within the brief provided, it is useful to distinguish three themes:

- **Learning to use ICT** - this means learning to use ICT technologies and applications to achieve some useful outcome (e.g. how to use a word processor to write a letter);

- **Learning with the use of ICT** – this means undertaking learning that uses ICT as a specific tool within the learning process (e.g. using educational games in a social science subject);

- **Learning that enhances ICT use** – this means learning that helps a student to better utilise their existing ICT capabilities (e.g. learning about marketing and communication concepts, which can be applied towards better web page design).

These are discussed below.

**Learning to use ICT**

For the most part, ICT competence in an applied or VET context only considers learning to use the technology. The ‘use’ of ICT by young people completing Training Package-based learning is not just about the technology. It has to be about
more than just the transfer of skills and knowledge, but how learning is applied in a given context; that is, learning and doing are linked.

Learning to use ICT and enter into a career pathways associated with use of ICT is central to this investigative research report.

**Learning with the use of ICT**

It is important to realise that one of the notable pressures on teachers of ICT is the actual use of ICT to enhance how they teach and students learn. ICT enhanced learning, or e-learning and the connected mobile or m-learning, is an enormous field of study abutting our topic area for this report. E-learning can include technology such as computers, handheld and mobile devices, digital media devices, interactive TV, electronic whiteboards to video and web conferencing. The research and analysis of e-learning is out-of-scope for this investigative project.

ICT can improve the learning experience. It can encourage students to draw in their own ICT-user skills to encourage and foster learning (Selwyn 2003:20). But the access to computer, infrastructure such as broadband Internet and such like are not, of itself, a technical panacea for engaging students, achieving better learning outcomes or improved teaching.

While directly relevant to this report investigation will not cover e-learning or enhancing learning through the use of ICT.

**Learning that enhances ICT use**

A third distinct aspect deals with enhancing ICT use through learning. As succinctly identified by OECD (2006:12):

> There is a direct and foundational relationship between basic education and literacy, and technology use and adoption. ICT can facilitate skills development and improved education, but only if the skills to use the technology have been built first.

The requirement for foundation skills to effectively engage with and use ICT is a topic that has been commented on indirectly in this report. The examination of dimensions to technical knowledge and a pedagogical model for ICT applied learning being two notable areas where investigation will indirectly abut this theme.

### 3.1.4 Australian Government ICT-related policy Initiatives

This investigative research report occurs against a backdrop of major policy change. It is not the intention of this report to investigate these policy initiatives. But some ICT-related policy initiatives do need to be noted.

In 2006, the World Bank published a report on ICT trends across different countries (Zhen-Wei Quang et. al., 2006). Australia’s broadband Internet infrastructure and sluggish speed compared very poorly with other developed countries. Local media and the (then) Labor opposition promoted a view that education and business were incapable of competing internationally until Australia possessed world-class broadband infrastructure (Sydney Morning Herald, 2006).

Now in government, the Federal Labor party has been taking steps to deliver a new higher speed National Broadband Network:

> As a key element in its plan for the future, the Australian Government has committed to provide up to $4.7 billion and to consider regulatory changes to facilitate the roll-out of a new open access, high-speed,
At the time of writing, proposals for this National Broadband Network have been sought and received by the Government, and are being assessed by a panel of experts (DBCDE, 2009). It is also important to note that, complementing National Broadband Network, the Federal Government also has a “Fibre Connections to Schools initiative”. This program makes available $100m to help schools arrange broadband connections (DEEWR, 2008a).

In addition to the National Broadband Network, the Federal Government has a number of “Digital Education Revolution” initiatives. DEEWR (2008b) explain that the Australian Government is investing funding of $2 billion to provide for:

- the National Secondary School Computer Fund, to provide for new information and communication technology (ICT) for all secondary schools with students in years to 9 to 12;
- the Fibre Connections to Schools initiative, a contribution of up to $100 million to support the development of fibre-to-the-premises (FTTP) broadband connections to Australian schools (i.e. the $100m program noted in the previous communications infrastructure section);
- collaboration with states and territories and Deans of Education to ensure new and continuing teachers have access to training in the use of ICT that enables them to enrich student learning;
- $32.6 million over two years to supply students and teachers with online curriculum tools and resources to support the national curriculum and conferencing facilities for specialist subjects such as languages;
- the development of online learning and access that will enable parents to participate in their child’s education; and
- $10 million over three years to develop support mechanisms to provide vital assistance for schools in the deployment of ICT provided through the National Secondary School Computer Fund.

Once they are implemented, these initiatives will impact on young people’s ICT-related skills and expectations. It is also noted that a review of online curriculum resources is due to be completed by 30 April 2009 (DEEWR 2008c).

The broader implications of current initiatives of the Federal Government include that:

- On the whole, for consumers, Australia’s current broadband communication speeds still tend to be significantly slower than major international competitors;
- A national broadband implementation for the education sector (MYCEETYA, 2005) can only advance at the pace set by the national broadband initiatives.
- In the short term emerging education technologies and applications that require high speed Internet connections will have greater difficulty operating outside metropolitan areas in Australia until the aims of the Australia Government’s National Broadband Network are achieved.
- Once the roll-out phase of the $4.7bn National Broadband Network commences, this is likely require a significant number of workers trained under the ICT-related Training Packages that form the very core of this investigative report.
2. Investigation of ICT-related Training Packages

The Training Packages and qualifications forming the focus for this investigative research report are some of the most important when we consider their impact on GDP, to participation rates in the Australian labour market and enrolment numbers.

The following chapter will confirm and review the Training Packages and qualifications that are to be studied.

2.1 ICT-related Training Packages and qualifications identified

The focus for this investigative research report is on Training Packages and qualifications under Innovation and Business Skills Australia’s (IBSA) management. As of March 2009, the scope of study includes:

- **CUF07 Screen and Media Training Package** and specifically broadcasting and media, including interactive digital media and animation as part of studies in screen;
- **ICA05 Information and Communications Technology Training package** and specifically information technology (IT) and computing;
- **ICT02 Telecommunications Training Package** and telecommunications; and
- **ICP05 Printing and Graphic Arts Training Package** and particularly general approaches to printing and graphic art, desktop publishing, and multimedia.

The following table places the relevant qualifications into perspective within and across the Training Packages. The qualifications with a tick (√) are ones that directly relate to ICT and may be run in schools as applied or vocational courses. Those with an arrow (←) have relevance to entry-level training but are not reviewed as part of this investigation.

<p>| Summary of AQF Qualifications in CUF07 Screen and Media Training Package |</p>
<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Preparatory Pathway Qualifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUF10107</td>
<td>Certificate I in Creative Industries</td>
<td>√</td>
</tr>
<tr>
<td>CUF20107</td>
<td>Certificate II in Creative Industries (Media)</td>
<td>√</td>
</tr>
<tr>
<td>Broadcast Technology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUF30207</td>
<td>Certificate III in Broadcast Technology</td>
<td>√</td>
</tr>
<tr>
<td>CUF40307</td>
<td>Certificate IV in Broadcast Technology</td>
<td></td>
</tr>
<tr>
<td>CUF50307</td>
<td>Diploma of Broadcast Technology</td>
<td></td>
</tr>
<tr>
<td>Costume</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUF40507</td>
<td>Certificate IV in Costume for Performance</td>
<td></td>
</tr>
<tr>
<td>CUF50507</td>
<td>Diploma of Costume for Performance</td>
<td></td>
</tr>
<tr>
<td>Interactive Digital Media</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUF40207</td>
<td>Certificate IV in Interactive Digital Media</td>
<td></td>
</tr>
<tr>
<td>CUF50207</td>
<td>Diploma of Interactive Digital Media</td>
<td></td>
</tr>
<tr>
<td>Make-up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUF40407</td>
<td>Certificate IV in Make-up</td>
<td></td>
</tr>
<tr>
<td>CUF50407</td>
<td>Diploma of Specialist Make-up Services</td>
<td></td>
</tr>
<tr>
<td>Scenery and Set Construction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUF30307</td>
<td>Certificate III in Scenery and Set Construction</td>
<td></td>
</tr>
<tr>
<td>CUF40607</td>
<td>Certificate IV in Scenery and Set Construction</td>
<td></td>
</tr>
<tr>
<td>CUF50607</td>
<td>Diploma of Scenery and Set Construction</td>
<td></td>
</tr>
<tr>
<td>Screen and Media</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUF30107</td>
<td>Certificate III in Media</td>
<td>√</td>
</tr>
</tbody>
</table>
### Summary of AQF Qualifications in CUF07 Screen and Media Training Package

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUF40107</td>
<td>Certificate IV in Screen and Media</td>
</tr>
<tr>
<td>CUF50107</td>
<td>Diploma of Screen and Media</td>
</tr>
<tr>
<td>CUF60107</td>
<td>Advanced Diploma of Screen and Media</td>
</tr>
</tbody>
</table>

### Summary of AQF Qualifications in ICA05 Information and Communications Technology Training Package

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICA10105</td>
<td>Certificate I in Information Technology ✓</td>
</tr>
<tr>
<td>ICA20105</td>
<td>Certificate II in Information Technology ✓</td>
</tr>
<tr>
<td>ICA30105</td>
<td>Certificate III in Information Technology ✓</td>
</tr>
<tr>
<td>ICA40105</td>
<td>Certificate IV in Information Technology (General)</td>
</tr>
<tr>
<td>ICA40205</td>
<td>Certificate IV in Information Technology (Support)</td>
</tr>
<tr>
<td>ICA40305</td>
<td>Certificate IV in Information Technology (Websites)</td>
</tr>
<tr>
<td>ICA40405</td>
<td>Certificate IV in Information Technology (Networking)</td>
</tr>
<tr>
<td>ICA40505</td>
<td>Certificate IV in Information Technology (Programming)</td>
</tr>
<tr>
<td>ICA40605</td>
<td>Certificate IV in Information Technology (Testing)</td>
</tr>
<tr>
<td>ICA40705</td>
<td>Certificate IV in Information Technology (Systems Analysis and Design)</td>
</tr>
<tr>
<td>ICA40805</td>
<td>Certificate IV in Information Technology (Multimedia)</td>
</tr>
<tr>
<td>ICA50105</td>
<td>Diploma of Information Technology (General)</td>
</tr>
<tr>
<td>ICA50205</td>
<td>Diploma of Information Technology (Project Management)</td>
</tr>
<tr>
<td>ICA50305</td>
<td>Diploma of Information Technology (Systems Administration)</td>
</tr>
<tr>
<td>ICA50405</td>
<td>Diploma of Information Technology (Networking)</td>
</tr>
<tr>
<td>ICA50505</td>
<td>Diploma of Information Technology (Database Design and Development)</td>
</tr>
<tr>
<td>ICA50805</td>
<td>Diploma of Information Technology (Website Development)</td>
</tr>
<tr>
<td>ICA50905</td>
<td>Diploma of Information Technology (Software Development)</td>
</tr>
<tr>
<td>ICA50905</td>
<td>Diploma of Information Technology (Systems Analysis and Design)</td>
</tr>
<tr>
<td>ICA60105</td>
<td>Advanced Diploma of Information Technology</td>
</tr>
<tr>
<td>ICA60208</td>
<td>Advanced Diploma of Information Technology (Network Security)</td>
</tr>
<tr>
<td>ICA60308</td>
<td>Advanced Diploma of Information Technology (E-security)</td>
</tr>
</tbody>
</table>

### Summary of AQF Qualifications in ICT02 Telecommunications Training Package

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT20208</td>
<td>Certificate II in Telecommunications ✓</td>
</tr>
<tr>
<td>ICT20308</td>
<td>Certificate II in Telecommunications Cabling ←</td>
</tr>
<tr>
<td>ICT20408</td>
<td>Certificate II in Telecommunications Access Network Cabling ←</td>
</tr>
<tr>
<td>ICT20508</td>
<td>Certificate II in Telecommunications Digital Reception Technology ←</td>
</tr>
<tr>
<td>ICT30208</td>
<td>Certificate III in Telecommunications ✓</td>
</tr>
<tr>
<td>ICT30302</td>
<td>Certificate III in Telecommunications Cabling and Customer Premises ←</td>
</tr>
<tr>
<td>ICT30408</td>
<td>Certificate III in Telecommunications Access and Associated Services ←</td>
</tr>
<tr>
<td>ICT30508</td>
<td>Certificate III in Telecommunications Digital Reception Technology ←</td>
</tr>
<tr>
<td>CUF30207</td>
<td>Certificate III in Broadcast Technology (from Screen &amp; Media TP)* ←</td>
</tr>
<tr>
<td>ICT40208</td>
<td>Certificate IV in Telecommunications Engineering</td>
</tr>
<tr>
<td>ICT40302</td>
<td>Certificate IV in Telecommunications Computer Systems</td>
</tr>
<tr>
<td>ICT40408</td>
<td>Certificate IV in Telecommunications Network Planning</td>
</tr>
<tr>
<td>ICT40508</td>
<td>Certificate IV in Telecommunications Networks</td>
</tr>
<tr>
<td>ICT40608</td>
<td>Certificate IV in Telecommunications Computer Telephony Integration</td>
</tr>
<tr>
<td>ICT40708</td>
<td>Certificate IV in Telecommunications Radio Communications</td>
</tr>
<tr>
<td>CUF40307</td>
<td>Certificate IV in Broadcast Technology</td>
</tr>
<tr>
<td>ICT50202</td>
<td>Diploma of Telecommunications Engineering</td>
</tr>
<tr>
<td>ICT50302</td>
<td>Diploma of Telecommunications Computer Systems</td>
</tr>
<tr>
<td>ICT50402</td>
<td>Diploma of Telecommunications Photonics</td>
</tr>
<tr>
<td>ICT50508</td>
<td>Diploma of Telecommunications Networks</td>
</tr>
<tr>
<td>CUF50307</td>
<td>Diploma of Broadcast Technology</td>
</tr>
<tr>
<td>ICT60202</td>
<td>Advanced Diploma of Telecommunications Engineering</td>
</tr>
<tr>
<td>ICT60302</td>
<td>Advanced Diploma of Telecommunications Computer Systems</td>
</tr>
<tr>
<td>ICT60408</td>
<td>Advanced Diploma of Telecommunications Networks</td>
</tr>
<tr>
<td>Package qualifications</td>
<td>Summary of AQF qualifications in ICP05 Printing and Graphic Arts Training</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>Printing and Graphic Arts</td>
<td>ICP20105 Certificate II in Printing and Graphic Arts (General) ✓</td>
</tr>
<tr>
<td></td>
<td>ICP50105 Diploma of Printing and Graphic Arts (Digital Production)</td>
</tr>
<tr>
<td>Graphic Media</td>
<td>ICP20205 Certificate II in Printing and Graphic Arts (Desktop Publishing) ✓</td>
</tr>
<tr>
<td></td>
<td>ICP30105 Certificate III in Printing and Graphic Arts (Graphic Design Production) ✓</td>
</tr>
<tr>
<td></td>
<td>ICP30205 Certificate III in Printing and Graphic Arts (Graphic Pre-press) ✓</td>
</tr>
<tr>
<td></td>
<td>ICP30305 Certificate III in Printing and Graphic Arts (Multimedia) ✓</td>
</tr>
<tr>
<td></td>
<td>ICP40105 Certificate IV in Printing and Graphic Arts (Graphic Pre-press)</td>
</tr>
<tr>
<td></td>
<td>ICP40205 Certificate IV in Printing and Graphic Arts (Multimedia)</td>
</tr>
<tr>
<td></td>
<td>ICP50205 Diploma of Printing and Graphic Arts (Multimedia)</td>
</tr>
<tr>
<td>Printing</td>
<td>ICP20305 Certificate II in Printing and Graphic Arts (Instant Print) ←</td>
</tr>
<tr>
<td></td>
<td>ICP20405 Certificate II in Printing and Graphic Arts (Print Production Support) ←</td>
</tr>
<tr>
<td></td>
<td>ICP20505 Certificate II in Printing and Graphic Arts (Screen Printing) ←</td>
</tr>
<tr>
<td></td>
<td>ICP30405 Certificate III in Printing and Graphic Arts (Instant Print) ←</td>
</tr>
<tr>
<td></td>
<td>ICP30505 Certificate III in Printing and Graphic Arts (Printing) ←</td>
</tr>
<tr>
<td></td>
<td>ICP30605 Certificate III in Printing and Graphic Arts (Screen Printing) ←</td>
</tr>
<tr>
<td></td>
<td>ICP40305 Certificate IV in Printing and Graphic Arts (Printing) ←</td>
</tr>
<tr>
<td></td>
<td>ICP50305 Diploma of Printing and Graphic Arts (Printing) ←</td>
</tr>
<tr>
<td>Converting, Binding and Finishing</td>
<td>ICP20605 Certificate II in Printing and Graphic Arts (Converting, Binding and Finishing) ←</td>
</tr>
<tr>
<td></td>
<td>ICP30705 Certificate III in Printing and Graphic Arts (Print Finishing) ←</td>
</tr>
<tr>
<td></td>
<td>ICP40405 Certificate IV in Printing and Graphic Arts (Print Finishing) ←</td>
</tr>
<tr>
<td>Sacks and Bags</td>
<td>ICP20705 Certificate II in Printing and Graphic Arts (Sacks and Bags) ←</td>
</tr>
<tr>
<td></td>
<td>ICP30805 Certificate III in Printing and Graphic Arts (Sacks and Bags) ←</td>
</tr>
<tr>
<td>Cartons and Corrugating</td>
<td>ICP20805 Certificate II in Printing and Graphic Arts (Cartons) ←</td>
</tr>
<tr>
<td></td>
<td>ICP20905 Certificate II in Printing and Graphic Arts (Corrugating) ←</td>
</tr>
<tr>
<td></td>
<td>ICP30905 Certificate III in Printing and Graphic Arts (Cartons and Corrugating) ←</td>
</tr>
<tr>
<td>Mail House</td>
<td>ICP21005 Certificate II in Printing and Graphic Arts (Mail House) ←</td>
</tr>
<tr>
<td></td>
<td>ICP31005 Certificate III in Printing and Graphic Arts (Mail House) ←</td>
</tr>
<tr>
<td></td>
<td>ICP40505 Certificate IV in Printing and Graphic Arts (Mail House) ←</td>
</tr>
<tr>
<td>Ink Manufacture</td>
<td>ICP21105 Certificate II in Printing and Graphic Arts (Ink Manufacture) ←</td>
</tr>
<tr>
<td></td>
<td>ICP31105 Certificate III in Printing and Graphic Arts (Ink Manufacture) ←</td>
</tr>
<tr>
<td>Management/Sales</td>
<td>ICP40705 Certificate IV in Printing and Graphic Arts (Management/Sales)</td>
</tr>
<tr>
<td></td>
<td>ICP40805 Certificate IV in Printing and Graphic Arts (Process Leadership)</td>
</tr>
<tr>
<td></td>
<td>ICP50405 Diploma of Printing and Graphic Arts (Management/Sales)</td>
</tr>
<tr>
<td></td>
<td>ICP50505 Diploma of Printing and Graphic Arts (Process Improvement)</td>
</tr>
</tbody>
</table>
2.2 Contribution to GDP

The following table confirms key economic and employment data for the major industry divisions that are spanned by IBSA's coverage. The industries are defined using the typical industry classifications in place prior to 2007.

Table 2 - IBSA coverage by total employment and estimated GDP 2007-2008

<table>
<thead>
<tr>
<th>IBSA Industry Coverage</th>
<th>Total Sector GDP as Percentage of All Industries 2007-2008 (est.)</th>
<th>Total Employment November 2007</th>
<th>Percentage of Total National Employment November 2007</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Services^</td>
<td>11.36</td>
<td>1,270,000</td>
<td>12.1</td>
</tr>
<tr>
<td>Cultural Industries*</td>
<td>1.5</td>
<td>286,000</td>
<td>2.7</td>
</tr>
<tr>
<td>Education</td>
<td>5.5</td>
<td>714,651</td>
<td>6.8</td>
</tr>
<tr>
<td>Financial Services</td>
<td>7.5</td>
<td>395,000</td>
<td>3.7</td>
</tr>
<tr>
<td>ICT**</td>
<td>3.9</td>
<td>198,000</td>
<td>1.8</td>
</tr>
<tr>
<td>Printing^^</td>
<td>2.1</td>
<td>105,600</td>
<td>1.0</td>
</tr>
<tr>
<td>All IBSA industries</td>
<td>31.86</td>
<td>2,969,251</td>
<td>28.1</td>
</tr>
<tr>
<td>All industries</td>
<td>100.00</td>
<td>10,559,800</td>
<td>100</td>
</tr>
</tbody>
</table>

^ includes Property services. * Includes Recreational services. ** Communication services classification
^^ all sub-divisions including publishing and paper

The economic impact of ICT on the Australian economy is substantial. The impact goes beyond the contribution ICT makes to productivity within industry. As depicted below, the total spend on ICT has represented an increasing proportion of economic activity.

Table 3 - Total ICT Spending Australia 2003-08


(OECD, 2008a: 68)


2.3 Comparative analysis of ICT-related Training Packages and qualifications

This section uses NCVER data to confirm overall comparative enrolments and success in public vocational education and training (VET) for IBSA’s Training Packages. The first table confirms the overall enrolments from 2002 to 2006 (NCVER, 2007a:Table 25). The highlighted figures have also been ‘rolled up’ to give an overall IBSA-specific view.

Table 4 IBSA ICT-related Training Packages course enrolments by Training Package, 2002 to 2006(1), Australia

<table>
<thead>
<tr>
<th>Training Package</th>
<th>2002 ('000)</th>
<th>2003 ('000)</th>
<th>2004 ('000)</th>
<th>2005 ('000)</th>
<th>2006(2)(3) ('000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUF - Film, TV, Radio and Multimedia*</td>
<td>0.8</td>
<td>5.7</td>
<td>7.7</td>
<td>8.6</td>
<td>9.4</td>
</tr>
<tr>
<td>ICA - Information Technology</td>
<td>81.2</td>
<td>84.8</td>
<td>72.8</td>
<td>67.5</td>
<td>70.0</td>
</tr>
<tr>
<td>ICP - Printing and Graphic Arts</td>
<td>3.7</td>
<td>3.8</td>
<td>3.5</td>
<td>3.5</td>
<td>3.4</td>
</tr>
<tr>
<td>ICT - Telecommunications</td>
<td>13.9</td>
<td>14.2</td>
<td>11.5</td>
<td>10.7</td>
<td>10.4</td>
</tr>
</tbody>
</table>

| Training Packages Total course enrolments for above four IBSA Training packages | 99.6 | 108.5 | 95.5 | 90.3 | 93.2 |
| IBSA ICT-related TP as a percentage of total course enrolments All Training Packages | 49.9 | 52.9 | 49.7 | 47.5 | 46.9 |

Source: National VET provider collection, 2006
* Superseded by CUF07 Screen and Media Training Package

Of the 1.99 million students enrolled in the public VET system during 2006, IBSA managed three of the top ten Training Packages as ranked by student enrolment numbers (NCVER, 2007b: Table 6, page 12).

The following table gives more detailed information on the enrolments in the main ICT-related qualifications within the four Training Packages.

The italicised qualifications and enrolment numbers apply to Certificate I, II and III courses that are predominantly used in structured school to work or entry-level training.

Table 5 Enrolments in main qualifications under IBSA Technology Related Training Packages 2001-2006

<table>
<thead>
<tr>
<th>Training Packages and Qualifications</th>
<th>2002(a)</th>
<th>2003(a)</th>
<th>2004(a)</th>
<th>2005(a)</th>
<th>2006(b)(c)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUF - Film, TV, Radio and Multimedia</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CUF10101 - Certificate I in Media</td>
<td>40</td>
<td>25</td>
<td>20</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>CUF20301 - Certificate II in Screen</td>
<td>0</td>
<td>140</td>
<td>210</td>
<td>220</td>
<td>290</td>
</tr>
<tr>
<td>CUF20401 - Certificate II in Broadcasting (Radio)</td>
<td>5</td>
<td>110</td>
<td>115</td>
<td>180</td>
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**ICP - Printing and Graphic Arts**

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<td>10</td>
<td>0</td>
</tr>
<tr>
<td>ICP41399 - Certificate IV in Printing and Graphic Arts (Printing)</td>
<td>10</td>
<td>15</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP41499 - Certificate IV in Printing and Graphic Arts (Print Finishing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP42199 - Certificate IV in Printing and Graphic Arts (Screen Printing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP46199 - Certificate IV in Printing and Graphic Arts (General)</td>
<td>20</td>
<td>10</td>
<td>0</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>ICP46299 - Certificate IV in Printing and Graphic Arts (Management/Sales)</td>
<td>45</td>
<td>30</td>
<td>25</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>ICP50399 - Diploma of Printing and Graphic Arts (Graphic Pre-press)</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>ICP50499 - Diploma of Printing and Graphic Arts (Multimedia)</td>
<td>40</td>
<td>65</td>
<td>120</td>
<td>115</td>
<td>40</td>
</tr>
<tr>
<td>Training Packages and Qualifications</td>
<td>2002(a)</td>
<td>2003(a)</td>
<td>2004(a)</td>
<td>2005(a)</td>
<td>2006(b)/(c)</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>-------------</td>
</tr>
<tr>
<td>ICP51399 - Diploma of Printing and Graphic Arts (Printing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP56199 - Diploma of Printing and Graphic Arts (General)</td>
<td>'c'</td>
<td>35</td>
<td>35</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>ICP56299 - Diploma of Printing and Graphic Arts (Management/Sales)</td>
<td>45</td>
<td>60</td>
<td>40</td>
<td>25</td>
<td>15</td>
</tr>
<tr>
<td>ICP60399 - Advanced Diploma of Printing and Graphic Arts (Graphic Press)</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP60499 - Advanced Diploma of Printing and Graphic Arts (Multimedia)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP66299 - Advanced Diploma of Printing and Graphic Arts (Management/Sales)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP20105 - Certificate II in Printing and Graphic Arts (General)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>ICP20205 - Certificate II in Printing and Graphic Arts (Desktop Publishing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>145</td>
</tr>
<tr>
<td>ICP20305 - Certificate II in Printing and Graphic Arts (Instant Print)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP20405 - Certificate II in Printing and Graphic Arts (Print Production Support)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>ICP20505 - Certificate II in Printing and Graphic Arts (Screen Printing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP20605 - Certificate II in Printing and Graphic Arts (Converting, Binding and Finishing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ICP30105 - Certificate III in Printing and Graphic Arts (Graphic Design Production)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>ICP30205 - Certificate III in Printing and Graphic Arts (Graphic Pre-press)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>55</td>
</tr>
<tr>
<td>ICP30305 - Certificate III in Printing and Graphic Arts (Multimedia)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>70</td>
</tr>
<tr>
<td>ICP30405 - Certificate III in Printing and Graphic Arts (Instant Print)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>ICP30505 - Certificate III in Printing and Graphic Arts (Printing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>160</td>
</tr>
<tr>
<td>ICP30605 - Certificate III in Printing and Graphic Arts (Screen Printing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>50</td>
</tr>
<tr>
<td>ICP30705 - Certificate III in Printing and Graphic Arts (Print Finishing)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>ICP40105 - Certificate IV in Printing and Graphic Arts (Graphic Pre-press)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>ICP40205 - Certificate IV in Printing and Graphic Arts (Multimedia)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>115</td>
</tr>
<tr>
<td>ICP - Printing and Graphic Arts</td>
<td>3,155</td>
<td>3,205</td>
<td>2,830</td>
<td>2,870</td>
<td>2,935</td>
</tr>
<tr>
<td>TOTAL ICP TECHNOLOGY RELATED ENTRY LEVEL</td>
<td>2,650</td>
<td>2,845</td>
<td>2,470</td>
<td>2,610</td>
<td>2,000</td>
</tr>
</tbody>
</table>

**ICT - Telecommunications**

| ICT20102 - Certificate II in Customer Contact | 0 | 10 | 520 | 510 | 275 |
| ICT20197 - Certificate II in Telecommunications | 300 | 290 | 205 | 5 | 20 |
| ICT20202 - Certificate II in Telecommunications | 0 | 10 | 175 | 430 | 300 |
| ICT20297 - Certificate II in Telecommunications (Cabling) | 360 | 520 | 185 | 15 | 0 |
| ICT20302 - Certificate II in Telecommunications Cabling | 0 | 0 | 150 | 205 | 250 |
| ICT20399 - Certificate II in Telecommunications (CAN) | 60 | 40 | 0 | 0 | 0 |
| ICT20402 - Certificate II in Telecommunications Access Network | 0 | 0 | 0 | 0 | 0 |
| ICT20499 - Certificate II in Telecommunications (Call Centres) | 1,770 | 1,440 | 135 | 0 | 0 |
| ICT30102 - Certificate III in Customer Contact | 0 | 310 | 4,545 | 6,620 | 6,975 |
| ICT30197 - Certificate III in Telecommunications | 470 | 610 | 140 | 0 | 0 |
| ICT30202 - Certificate III in Telecommunications | 0 | 15 | 130 | 230 | 530 |
| ICT30297 - Certificate III in Telecommunications (CPE) | 0 | 0 | 0 | 0 | 0 |
| ICT30302 - Certificate III in Telecommunications Cabling and Customer Premises Equipment | 0 | 0 | 60 | 150 | 40 |
| ICT30397 - Certificate III in Telecommunications (CAN) | 20 | 'c' | 0 | 0 | 0 |
| ICT30497 - Certificate III in Telecommunications (Cabling) | 355 | 240 | 160 | 5 | 0 |
| ICT30599 - Certificate III in Telecommunications (Call Centres) | 7,000 | 6,905 | 2,710 | 305 | 30 |
| ICT30699 - Certificate III in Telecommunications (Customer Premises, Cabling and Equipment) | 20 | 0 | 0 | 0 | 0 |
| ICT40102 - Certificate IV in Customer Contact | 0 | 20 | 345 | 1,050 | 1,170 |
| ICT40197 - Certificate IV in Telecommunications | 175 | 25 | 5 | 0 | 0 |
| ICT40202 - Certificate IV in Telecommunications Engineering | 0 | 70 | 80 | 85 | 85 |
| ICT40599 - Certificate IV in Telecommunications (Call Centres) | 1,830 | 1,390 | 745 | 170 | 5 |
| ICT50102 - Diploma of Customer Contact Leadership | 0 | 0 | 0 | 0 | 0 |
| ICT50197 - Diploma of Telecommunications Engineering | 85 | 90 | 35 | 5 | 0 |
| ICT50202 - Diploma of Telecommunications Engineering | 0 | 25 | 65 | 75 | 60 |
The above table confirms not just the number of enrolments in the ICT-related qualifications, it confirms the critical importance of ICT-related qualifications in terms of total enrolments in government funded VET courses at or below Certificate III.

As a percentage of total enrolments Certificate I to III qualifications dominate across the VET system (See Figure 9 below). Some 43% of government funded students in the VET system in 2006 were completing Certificates I or II or lower (DEST, 2008:34). Males and females in Certificate II or lower qualifications each formed around 26% of total enrolments in government funded VET (DEST, 2008:35). Over 77% of funded students successfully completed Certificates II or lower in 2006 (DEST, 2008:39).

Figure 9 - Number of qualification equivalents successfully completing government funded VET 2002-2006

(Note: the 2007 figures are estimates. DEST, 2008:38)
It is possible to go some way to isolating the comparative numbers of students completing ICT-related as opposed to all other Training Packages or qualifications. This is depicted in the chart below. Information technology had its own category, but telecommunications fell into ‘engineering related’, and printing, media, broadcast and multimedia design fell into ‘creative arts’ and ‘mixed fields’. As depicted in the table below from DEST, these categories formed three of the top 5 areas by proportion of graduates from government funded VET in 2005.

Figure 10 - Proportion of qualifications completed by total VET students, by field of education, 2005

(DEST: 2008: 43)
3. Victorian Certificate of Applied Learning (VCAL)

There are many success stories of integrating vocational education and training national qualifications into school-based programmes. The Victorian Certificate of Applied Education (VCAL) is an area being investigated in this report. This is being done to examine how flexibility can be constructed into IBSA’s technology-related Training Packages and qualifications so as to strengthen the links with VCAL specifically, and by extension, other VET in schools or pre-vocational programs.

VCAL is an important curriculum to study as it is a conscious effort to create a post-compulsory qualification with an applied learning approach. VCAL was developed in response to the Kirby Report in 2000 on *The Ministerial Review of Post Compulsory Education and Training Pathways in Victoria* (Kirby, 2000). The Kirby Report made it clear that a broader range of programs was required to meet the needs of some young people who are in the post compulsory years. The Report states the following:

*Those young people who leave school before completing Year 11 have experienced difficulties more often and have not adjusted well either to the VCE or to school as a social setting.* (Kirby, 2000: 53)

*Poor results at school are likely to discourage early leavers from continuing in some form of education and training.* (Kirby, 2000:58)

*Those who have difficulties with current arrangements will typically need different learning contexts.* (Kirby, 2000:10) (As cited in Holmesglen, 2003)

Kirby refocussed educational effort on improved pathways from school to work or further learning. A target was set to move from 20% to 10% of students not completing Year 12 by 2010. The Victorian government saw VCAL as an innovative solution that would promote:

- the development of knowledge and employability skills that help prepare the individual for employment and for the participation in the broader context of family, community and lifelong learning
- the development of knowledge and skills that assist the individual to make informed vocational choices within specific industry sectors and/or to facilitate pathways to further learning. (Holmesglen, 2003: Part B page 5)

Figure 11 - VCAL learning model

![VCAL Learning Model](VCAA, 2006:1)
The VCAL applied learning model places an emphasis on students being engaged in hands-on, practical work. However, this is complemented and balanced with the theoretical understandings and knowledge required to complete a task in a given context. This co-dependence between theory and skills and context and application within a cycle of learning as depicted above.

The Victorian Curriculum and Assessment Authority suggest applied learning has a number of advantages:

- Improved student commitment;
- Provides a context for learning the generic skills that are valued in the workplace, e.g. problem solving, work effectively with others and in teams, leadership and personal responsibility;
- Learning engages students;
- Improved self esteem and confidence for those involved;
- Improved transition for students from school to work and/or to further education;
- Caters effectively for students with different preferred learning styles;
- Provides a meaningful context for learning both theoretical concepts and practical skills. (VCAA, 2006:2)

The VCAL curriculum, as originally accredited in 2003 (Holmesglen, 2003), consists of three award levels:

- Victorian Certificate of Applied Learning (Foundation) (Certificate I equivalent level);
- Victorian Certificate of Applied Learning (Intermediate) (Certificate II equivalent level);
- Victorian Certificate of Applied Learning (Senior). (Certificate III equivalent level).

Each of these award levels has a nominal duration of 1,000 hours. Importantly, the qualification places less emphasis on time serving and more on competence as the attendance and hours are not set requirements to receive a VCAL qualification. However, within a school setting, a typical VCAL learning program would be based on a full time load of independent learning and timetabled class time of 1,000 hours. In other educational settings the nominal hours may vary taking into consideration the specific needs of the student.

Each VCAL award also had to balance four key elements or what were called curriculum strands:

1. Literacy and Numeracy Skills
2. Industry Specific Skills
3. Work Related Skills

The strands reinforce the fact the learning process is not just about learning for work, or academic understanding. It was far more oriented to applied capability.

In terms of delivery the VCAL reinforced the principles and adherence to Australian Qualifications Training Framework and the principles of building partnerships with
TAFE, other Registered Training Organisations, industry, businesses and the community. As such learning encourages application in workplaces and recognition of competencies obtained through statements of attainment for any units of competency or qualifications obtained.

VCAL is not written for one occupation or industry career pathway. It is designed to encompass a range of approaches to learning that could underpin entry into multiple pathways to further learning or work.

In 2004 a review into VCAL was completed. The *Review of the Victorian Certificate of Applied Learning: Final Report* by Victorian Curriculum and Assessment Authority confirmed the need to better integrate ICT into the VCAL units, proposing:

*That specific reference to information and communications technology (ICT) skills, for the workplace, is included in the Terms of Reference for the review when the VCAL units are being reviewed.*

*That professional development and curriculum resources be provided/developed for teachers which highlight how ICT skills can be integrated into VCAL units* (VCAA, 2004:2)

The approach suggested either the:

- development of ICT unit/s; or
- the option of including ICT as either an additional strand; or
- be included in the learning outcomes in one or more of the existing VCAL strands (VCAA, 2004:7 & 8)

As of February 2009, the last option – the inclusion of statements on ICT use in each Unit within each strand – was being completed. As such, no specific ICT strand or ICT specific VCAL qualification has been developed. Instead the ICT focus for applied learning is covered in ICT-related VET courses.

The following tables firstly show the alignment of Training Package-based qualifications and Victorian VCE VET programs and, secondly, the total enrolment in these programs from 1998 to 2008. It is noted the total enrolment in VCE-VET aligned telecommunications courses is non existent as the program is being utilised by students in the VCAL-VET environment. As the costs of setting up “simulated telecommunications” training environments is very high and teachers with industry experience are difficult to recruit, it is a program that at present does not have a high take up at Secondary Colleges. Most students opt to enrol in apprenticeship programs where they are available (Interviews, Sutton in Bowles & Wilson, 2009).
### Table 6 - Training Package-based qualifications run in Victorian Schools 2009

<table>
<thead>
<tr>
<th>VCE VET Program</th>
<th>Training Package Origins for Qualification</th>
<th>Credits VCE &amp; VCAL</th>
</tr>
</thead>
</table>
| VCE VET Desktop Publishing and Printing program      | ICP20205 Certificate II in Printing and Graphic Arts (Desktop Publishing)  
ICP20105 Certificate II in Printing and Graphic Arts (General) | Y                                                                                                                                      |                                                                                  |
| VCE VET Electrotechnology (Shared Technology)        | ICAITS032B Provide network system administration  
ICTTC010C Place, secure and terminate optical fibre cable  
UTENES056A Apply technologies and concepts to electrotech work activities  
UTENES050A Identify and select components/accessories/materials for electrotech work activities  
ICTTC136A Install, maintain and modify customer premises communication cabling – ACA restricted rule  
21583VIC Certificate II in Electrotechnology (Shared Technology) | Y                                                                                                                                      |                                                                                  |
| VCE VET Information Technology program               | ICA20105 Certificate II in Information Technology  
ICA30105 Certificate III in Information Technology (Select units)  
ICTCC330A Manage customer relationships | Y                                                                                                                                      |                                                                                  |
| VCE VET Interactive Digital Media                    |                                                                                                                                      | Y                                                                                                                                      |                                                                                  |

Figure 12 - Victorian Certificate of Education ICT related VET subject enrolments 1998-2008

(Source: VCAA provided data, February 2009)
4. Landscape of the Digital Age

The ability of households in Australia to access information and communications technology (ICT) has been growing exponentially over the last 20 years. Not only has access grown, so has the speed, choice of connections and the power of the technologies. We need to appreciate this growth to better understand how developments affecting Australian households have also influenced young people’s use of ICT at home and at school.

This chapter provides an overview of the Australian ICT landscape within which this study is situated. The chapter seeks to provide the foundation to later investigate how ICT shapes the everyday activities of young people and affects their engagement with the relevant Training Packages and qualifications under IBSA’s management.

This chapter will cover:

- A view on the growth and penetration of electronic media and communications technology into Australian homes;
- A differentiation of synchronous and asynchronous communication and typical applications;
- Popular applications on the web.

4.1 Penetration of electronic media and communications technology in Australian households

Australian households are repositories of information, media and communication technologies. The Australian Media and Communications Authority has reported that, as of June 2008, there were a total of 7.23 million active Internet subscribers and 21.8 million Internet subscribers of all types in Australia; further, over 21.26 million mobile phone services in operation with 8.55 million subscribers connected to 3G mobile network services, and 11 million fixed line (terrestrial) telephone service subscribers (AMCA, 2007; AMCA, 2008: 45 & 47).

Figure 13 - Penetration of electronic media and communications technology in Australian homes 1994-2008

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobile phone</td>
<td>24.1</td>
<td>61</td>
<td>72</td>
<td>92</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Access to a home computer</td>
<td>29.4</td>
<td>36</td>
<td>53</td>
<td>61</td>
<td>70</td>
<td>98</td>
</tr>
<tr>
<td>Home internet access</td>
<td>3.9</td>
<td>32</td>
<td>46</td>
<td>60</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Dedicated games machine</td>
<td>17.8</td>
<td>15.9</td>
<td>32</td>
<td>32</td>
<td>54</td>
<td>77</td>
</tr>
<tr>
<td>DVD Player</td>
<td>-</td>
<td>6</td>
<td>23</td>
<td>68</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Pay TV</td>
<td>-</td>
<td>3</td>
<td>17</td>
<td>21</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

(Lincare, 2008; ABS, 2008g.b; ACMA, 2008:60)
The figures above show the massive leap between 1998 to 2007-08, in access to the Internet at home (from 3% to 91%), and a significant shift away from slow dial-up connections as the number of households with a Broadband Internet connection increased by 22% from 2007, to an estimated 4.3 million households in 2008 (Linacre, 2008). Wireless connections accounted for 14% (809,000) of all Australian broadband subscriptions at the end of June 2008, up from 433,000 in the December quarter 2007. (ABS, 2008g). The type of broadband connection being secured by households is depicted below.

The growth in Internet subscriptions has continued to grow steadily from 2005 to 2009.

**Figure 14 - Active Internet subscribers in Australia 2005-2009**

![Internet subscriber chart](chart.png)

^ Estimates January 2009
(ACMA: 2008:47 and industry subscriber data January 2009)

While 82% of homes have the Internet connected, 67% have broadband (ABS, 2008b). It is also noted that some 17% of Internet users at home have VOIP (ACMA, 2008: 49).

The massive change to ICT availability in households of Australia can be seen in the following figure that shows the change to household access to ICT from 1994 to 2009.

**Figure 15 - Type of Broadband Technology used by Households, by Region -2007-08**

![Broadband technology chart](chart2.png)

(Linacre, 2008)
The availability of ICT at home and in school makes Australian young people some of the most connected in the world. This fact will bear heavily in our later study on just how profoundly Australian digital natives engage with technologies in their everyday lives.

Figure 16 - Children under 15 access to computers, Internet and Broadband as a percentage of total households in Australia, 2008

<table>
<thead>
<tr>
<th>Access Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households with access to a home computer</td>
<td>90%</td>
</tr>
<tr>
<td>Households with access to the internet at home</td>
<td>82%</td>
</tr>
<tr>
<td>Households with access to broadband at home</td>
<td>67%</td>
</tr>
</tbody>
</table>

(ABS, 2008b)

4.2 Web 2.0 and synchronous versus asynchronous digital communication

Web 2.0 is an evolution over the original Internet because the user contributes content, design, collective intelligence, and participation in networks. It is designed to let users ‘mash up’ (combine) data and application from multiple sources into a single, integrated tool. In the world of Web 2.0 users Internet technology and applications becomes a personalised space using such thing as blogs, wikis, and social networking sites.

The emergence of Web 2.0 has changed how Australia’s communicate. To appreciate the extent to which this has occurred we need to appreciate the difference between Asynchronous and synchronous communication applications.

Synchronous occurs in a two-way or communication mode similar to what we would experience with face to face verbal communication. Synchronous events happen at the same time; for example, chat rooms, or in more traditional technology, telephone conversations. This means interactions are in real time and replicates the traditional classroom or social experience. Asynchronous events do not happen at the same time; these include discussion boards, or, more familiarly, posted letters. Computer (including desktop, laptop, mobile or other devices) mediated synchronous events allow for immediacy, in-the-moment dynamism. Computer mediated asynchronous events can promote thoughtful discussion.

Computer mediated asynchronous technologies deliver information, content and services one-way at a given point in time. That is, events that do not take place concurrently or in real time.

**Email** — Email is the most common form of electronic information exchange. Popular example would include Gmail, Microsoft® Outlook™ or Apple Mail.

**Application sharing** — Individuals may work collaboratively using applications that permit the generation of spreadsheets, text documents, project plans, music, graphics and so on. All participants can ‘take turns’, while seeing what is happening at all times. Popular examples would include MSN Messenger, Zoho or Google Gears.
Collaborative or social networking — This includes tools that promote interaction such as message boards where collaborative questions and answers can be posted, blogs where commentary or news on a particular subject is shared, or a Wiki where users share information or web pages; text chat or forums within which the user can communicate; and threaded discussions where many users interact and exchange information. Popular examples would include Windows Live Messenger™, Myspace, Facebook, Blogger or Linkedin.

Simulation, online games and virtual spaces — This may include online games, projects, virtual environments and simulations. Popular examples would include RuneScape, World of Warcraft or Second Life.

Video and audio sharing or streaming — These applications use audio and video to present and share materials using the Internet to computers or mobile devices. This includes audio streaming or broadcasts web radio. Popular examples would include YouTube, iTunes, .mobi, Flickr or Yahoo! Video.

Peer to Peer networks – In the sense used here it refers to the sharing of information or files or to communication (chat) between peers without any one person or server managing the relationship. Popular examples would include the now defunct Napster, Kazaar, and GNUnet and BiTorrent.

Media streaming or broadcasts — Distinct to video streaming, media broadcasts may push production level media content (TV, DVDs, Movies, etc.) occur over telecommunication networks such as the Internet or in Internet Protocol using such technologies as cable, satellite or wireless to be received on digital devices (computers or mobile phones), or by televisions fitted with decoders. Popular examples would include ipTV, Foxtel iQ or LinuxTV.

Interactive conferencing, webinar, teleconferencing, video telephony and webconferencing — audio and visual connections between individuals or groups. Popular examples would include Elluminate, WebEx or Microsoft Live Meeting.

VOIP telephony and audio — Voice over Internet Protocol is a general term for the collection of devices that permit voice communications, such as you would use with a standard telephone, connected via the Internet. This can be connected to any type on network, fixed mobile or satellite. Popular examples would include Skype, Truphone or Windows Live Call.

4.3 Popular applications on the web

This section seeks to provide a broad understanding on how Australian’s are using the Web. The following tables and figures are intended to give perspective to later analysis of how young people are engaging in the use of ICT and especially, accessing the Internet and Web 2.0 services.

The following chart from Australian Media and Communication Authority provides a snapshot in time as to what Australian’s used the Internet for in February 2008.
The following table confirms the top 20 websites accessed by Australian Internet users in 2008. The activities reflect a strong orientation towards use of technology (Internet connected devices) to complete typical daily activities. The following table adds weight to this analysis.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Usage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>98</td>
</tr>
<tr>
<td>Banking</td>
<td>72</td>
</tr>
<tr>
<td>News, sports or weather updates</td>
<td>72</td>
</tr>
<tr>
<td>Bill payment</td>
<td>66</td>
</tr>
<tr>
<td>Maps/directions</td>
<td>62</td>
</tr>
<tr>
<td>Directories (Yellow/WhitePages)</td>
<td>59</td>
</tr>
<tr>
<td>Airline ticket purchase</td>
<td>44</td>
</tr>
<tr>
<td>Instant messaging</td>
<td>38</td>
</tr>
<tr>
<td>Accommodation bookings</td>
<td>37</td>
</tr>
<tr>
<td>Auctions</td>
<td>37</td>
</tr>
<tr>
<td>Subscribe/sign up to email newsletters</td>
<td>36</td>
</tr>
<tr>
<td>Health and medicine sites</td>
<td>30</td>
</tr>
<tr>
<td>Education/study sites</td>
<td>29</td>
</tr>
<tr>
<td>Submitting forms or information to websites</td>
<td>27</td>
</tr>
<tr>
<td>Downloading audio</td>
<td>27</td>
</tr>
<tr>
<td>Online social networking</td>
<td>26</td>
</tr>
<tr>
<td>(e.g., Facebook, MySpace, LinkedIn)</td>
<td>24</td>
</tr>
<tr>
<td>Local/community information</td>
<td></td>
</tr>
<tr>
<td>Downloading video</td>
<td>20</td>
</tr>
<tr>
<td>Making payments for government services</td>
<td>19</td>
</tr>
<tr>
<td>Reading blogs</td>
<td>16</td>
</tr>
<tr>
<td>Online forums</td>
<td>13</td>
</tr>
<tr>
<td>Chat groups</td>
<td>12</td>
</tr>
<tr>
<td>Online radio</td>
<td>12</td>
</tr>
<tr>
<td>Streaming video</td>
<td>10</td>
</tr>
</tbody>
</table>

If we were to examine the top Internet sites in the world we would see the growth of the Web has been also been driven by people being able to access new activities unique to the digital environment. Ranking.com calculates the online popularity of the most visited websites and provides a free list of the top 25 sites on the World Wide Web (http://www.ranking.com). Examine the following top 25 Sites for 18 February 2009:

1. google.com
2. yahoo.com
3. msn.com
4. live.com
5. youtube.com
6. aol.com
7. microsoft.com
8. myspace.com
9. google.co.uk
10. ebay.com
11. facebook.com
12. wikipedia.org
13. ask.com
14. go.com
15. findstuff.com
16. google.ca
17. starware.com
18. casalemedia.com
19. blogspot.com
20. att.net
21. amazon.com
22. cnn.com
23. photobucket.com
24. mywebsearch.com
25. netzero.net

We can see most sites deal with services only accessible off the web. This includes information sharing and typical asynchronous social networking sites. Alongside standard search, support and e-business sites social networking sites have been responsible for generating large volumes of traffic on the Web. The fastest growing sites by visits per month were the social networking sites myspace.com and facebook.com. Each had around 115 million worldwide unique visitors per month in April 2008, and linkedin.com which has grown from 3.8 million monthly visitors in February 2008 to 7.7 million visitors in February 2009 (Arlington, 2008:1; Schoefield, 2009:1; & Freiert, 2008).
5. ICT change and occupational convergence

5.1 Occupational convergence

In the Digital Age the capacity of the technical innovations to change how we work or create new ways of work is profound. Digital integration has accelerated convergence of information, media, and communication technologies. Computers have got smaller, smarter and more mobile. This has made them an integral component of our lives; whether at work or not. As with computers so has the Internet embedded itself in over 1.5 billion people’s lives since it emerged as a public network just over 15 years ago. Technological convergence has been enhanced through the improved connectivity to faster networks that can switch between telecommunication options such as satellite, mobile or terrestrial. We now have the Internet anywhere, anytime, on demand using just about any device. ICT has become an integral component of work across most industries and occupations. More so it the use of technology has embedded itself in our everyday use for communicating, learning, entertainment, searching, navigating, shopping, banking, and so on.

The occupations targeted by IBSA’s technology-related Training Packages are some of the ones most affected by ICT change and convergence. The dynamic nature of IBSA technology-related and management occupations was highlighted by the major changes that resulted when the Australian and New Zealand Standard Industry Classification (ANZSIC) originating in 1993 was replaced by Australian and New Zealand Standard Classification of Occupations (ANZSCO) Version 2 released in 2006 (Bowles & Wilson, 2008:5).

The Australian Bureau of Statistics (ABS) Census in 2006 collected and reported data using the new ANZSCO 2006 classifications 2006. This data profoundly altered the number of employees that fell under IBSA’s industry responsibilities. It also served to confirm in more granular detail how some occupations no longer neatly fitted into an occupation that belong to an industry or a Training Package. This was most evident in providing a ‘high resolution’ understanding that IBSA needed to recalibrate how it targeted training to emerging or converging jobs. This was especially important in jobs that used IT, telecommunications or new media because they often fell across many different industries ‘boundaries’ and, as a result, qualifications in one Training Package could not meet the skill needs (Bowles & Wilson, 2008:6 & 40).

It is possible to isolate how important IBSA ICT-related Training Packages are to young people entering the workforce. The following table uses data specially commissioned by IBSA from the Australian Bureau of Statistics to confirm how many 15-24 year olds work in occupations that are targeted by these packages.

Table 8 - 15-24 year olds in employment by occupations relating to IBSA technology oriented Training Packages, 2006

<table>
<thead>
<tr>
<th>By Training Package Occupations 2006 Census</th>
<th>Total numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural industry</td>
<td>21,356</td>
</tr>
<tr>
<td>Computing and ICT^</td>
<td>21,613</td>
</tr>
<tr>
<td>Telecommunications^</td>
<td>7,207</td>
</tr>
<tr>
<td>Printing Industry</td>
<td>3,409</td>
</tr>
<tr>
<td><strong>Total for technology oriented Training Package occupations</strong></td>
<td><strong>53,585</strong></td>
</tr>
</tbody>
</table>

^ Approximate based on disaggregation of employment by ANZSCO for ICT industry (that includes telecommunications occupations), (Source Data tables prepared using ABS Census 2006 data, Bowles & Wilson, 2008)

Australian Bureau of Statistics, 2006 Census of Population and Housing, Hierarchy - Occupation 06 (ANZSCO) by Hierarchy - 5 Year Age Groups for Person Records, Australia, Employed. Canberra: ABS.
The table on the following page give more granular detail of the specific types of occupations and job roles the Training Packages and related qualifications cover.
5.1.1 IBSA Training Packages and ANZSIC and ANZSCO 2006 Coverage

The following table gives a current view of IBSA Training Packages and their alignment and coverage of industries, industry groups, typical activities and occupations:

Table 9 - IBSA managed Training Packages mapped to ANZSIC 2006 industry and ANZSCO 2006 occupations classifications

<table>
<thead>
<tr>
<th>Training Package</th>
<th>ANZSIC coverage (Division or Sub-division)</th>
<th>ANZSIC Group Codes and Titles</th>
<th>Typical technology related job activities ¹</th>
<th>ANZSCO Occupations ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUF07 Screen and Media Training Package</td>
<td>562 Television Broadcasting</td>
<td>5621 Free-to-Air Television Broadcasting</td>
<td>Radio broadcasting</td>
<td>212111 Artistic Director</td>
</tr>
<tr>
<td></td>
<td>561 Radio Broadcasting</td>
<td>5622 Cable and Other Subscription Broadcasting</td>
<td>Production scheduling</td>
<td>212112 Media Producer (excluding Video)</td>
</tr>
<tr>
<td></td>
<td>551 Motion Picture and Video Activities</td>
<td>5610 Radio Broadcasting</td>
<td>Photography</td>
<td>212113 Radio Presenter</td>
</tr>
<tr>
<td></td>
<td>162 Reproduction of Recorded Media (here or Printing)</td>
<td>5511 Motion Picture and Video Production</td>
<td>Development processing</td>
<td>212114 Television Presenter</td>
</tr>
<tr>
<td></td>
<td>699 Other Professional, Scientific and Technical Services</td>
<td>5512 Motion Picture and Video Distribution</td>
<td>Film or tape closed captioning</td>
<td>212312 Director (Film, Television, Radio or Stage)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5513 Motion Picture Exhibition</td>
<td>Film or video transfer service</td>
<td>212314 Film and Video Editor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5514 Post-production Services and Other Motion Picture and Video Activities</td>
<td>Television commercial production</td>
<td>212315 Program Director (Television or Radio)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1620 Reproduction of Recorded Media</td>
<td>Television program production</td>
<td>212318 Video Producer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6991 Professional Photographic Services</td>
<td>Radio station operation</td>
<td>212399 Film, Television, Radio and Stage Directors nec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motion picture film reproducing</td>
<td>212414 Radio Journalist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motion picture or video editing service</td>
<td>212416 Television Journalist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Motion picture production, special effects</td>
<td>399511 Broadcast Transmitter Operator</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Post-production facility, motion picture or video</td>
<td>399512 Camera Operator (Film, Television or Video)</td>
</tr>
<tr>
<td>ICA05 Information and Communications Technology Training Package</td>
<td>700 Computer System Design and Related Services</td>
<td>7000 Computer System Design and Related Services</td>
<td>Post synchronisation sound dubbing</td>
<td>399514 Make Up Artist</td>
</tr>
<tr>
<td></td>
<td>591 Internet Service Providers &amp; Web Search Portals</td>
<td>5910 Internet Service Providers and Web Search Portals</td>
<td>Sound dubbing service, motion picture</td>
<td>399517 Television Equipment Operator</td>
</tr>
<tr>
<td></td>
<td>592 Data Processing, Web Hosting and Electronic Information Storage Services</td>
<td>5921 Data Processing and Web Hosting Services</td>
<td>Subtitling of motion picture, film or video</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5922 Electronic Information Storage Services</td>
<td>Network administration</td>
<td>135111 Chief Information Officer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Computer system design and related services</td>
<td>135112 ICT Project Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Computer hardware consulting</td>
<td>135199 ICT Managers nec</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Programming</td>
<td>232414 Web Designer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Computer software consulting</td>
<td>261111 ICT Business Analyst</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Software development</td>
<td>261112 Systems Analyst</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Internet services management</td>
<td>261211 Multimedia Specialist</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Software installation</td>
<td>261212 Web Developer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Data storage and processing</td>
<td>261311 Analyst Programmer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Computer and computer peripheral equipment repair and maintenance</td>
<td>261312 Developer Programmer</td>
</tr>
</tbody>
</table>

¹ ANZSCO 2006; and IBSA (2006) Industry Skills Report, pp.18-20

<table>
<thead>
<tr>
<th>Training Package</th>
<th>ANZSIC coverage (Division or Sub-division)</th>
<th>ANZSIC Group Codes and Titles</th>
<th>Typical technology related job activities¹</th>
<th>ANZSCO Occupations⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICP05 Printing and Graphic Arts Training Package</td>
<td>161 Printing and Printing Support Services</td>
<td>1611 Printing&lt;br&gt;1612 Printing Support Services&lt;br&gt;Digital printing</td>
<td>Graphic design&lt;br&gt;Illustration&lt;br&gt;Print pre-press design&lt;br&gt;Pre-press production set up&lt;br&gt;Newspaper production&lt;br&gt;Printing&lt;br&gt;Sign writing&lt;br&gt;Screen printing&lt;br&gt;Photocopying&lt;br&gt;Relief printing&lt;br&gt;Digital design/illustrator</td>
<td>232411 Graphic Designer&lt;br&gt;392111 Binder and Finisher&lt;br&gt;392112 Screen Printer&lt;br&gt;392211 Graphic Pre-press Trades Worker&lt;br&gt;392311 Printing Machinist&lt;br&gt;392312 Small Offset Printer</td>
</tr>
<tr>
<td></td>
<td>692 Architectural, Engineering and Technical Services</td>
<td>6924 Other Specialised Design Services (Graphic Design)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT02 Telecommunications Training Package</td>
<td>580 Telecommunications Services</td>
<td>5801 Wired Telecommunications Network Operation&lt;br&gt;5802 Other Telecommunications Network Operation&lt;br&gt;5809 Other Telecommunications Services</td>
<td>Local telephone network operation&lt;br&gt;Set up wireless networks&lt;br&gt;Operating and maintaining switching and transmission facilities&lt;br&gt;Cabling&lt;br&gt;Broadcasting&lt;br&gt;Data security&lt;br&gt;Connecting telecommunication services&lt;br&gt;Maintaining and installing telecommunications systems</td>
<td>263311 Telecommunications Engineer&lt;br&gt;263312 Telecommunications Network Engineer&lt;br&gt;313211 Radiocommunications Technician&lt;br&gt;313212 Telecommunications Field Engineer&lt;br&gt;313213 Telecommunications Network Planner&lt;br&gt;313214 Telecommunications Technical Officer or Technologist&lt;br&gt;342411 Cabler (Data and Tele342412 Telecommunications Cable Jointer&lt;br&gt;342413 Telecommunications Linesworker&lt;br&gt;342414 Telecommunications Technician</td>
</tr>
</tbody>
</table>
5.2 Emerging technologies

Information, media and communication technologies will continue to change. These changes will affect how we work and further alter ‘boundaries’ between occupations. The New Media Consortium research work published in *The Horizon Report: 2008 Australia–New Zealand Edition* (Johnson, et. al., 2008), indicates that all six of the following technologies will significantly impact organisations and society within the next five years (Johnson, et. al., 2008, 2009: 4).

- **Mobiles.** Already considered as another component of the network on many campuses, mobiles continue to evolve rapidly. New interfaces, the ability to run third-party applications, and location-awareness have all come to the mobile device in the past year, making it an ever more versatile tool that can be easily adapted to a host of tasks for learning, productivity, and social networking. For many users, broadband mobile devices like the iPhone have already begun to assume many tasks that were once the exclusive province of portable computers.

- **Cloud Computing.** The emergence of large-scale “data farms” — large clusters of networked servers — is bringing huge quantities of processing power and storage capacity within easy reach. Inexpensive, simple solutions to offsite storage, multi-user application scaling, hosting, and multi-processor computing are opening the door to wholly different ways of thinking about computers, software, and files.

- **Geo-Everything.** Geocoded data has many applications, but until very recently, it was time-consuming and difficult for non-specialists to determine the physical coordinates of a place or object, and options for using that data were limited. Now, many common devices can automatically determine and record their own precise location and can save that data along with captured media (like photographs) or can transmit it to web-based applications for a host of uses. The full implications of geo-tagging are still unfolding, but the impact in research has already been profound.

- **The Personal Web.** Springing from the desire to reorganize online content rather than simply viewing it, the personal web is part of a trend that has been fueled by tools to aggregate the flow of content in customizable ways and expanded by an increasing collection of widgets that manage online content. The term personal web was coined to represent a collection of technologies that are used to configure and manage the ways in which one views and uses the Internet. Using a growing set of free and simple tools and applications, it is easy to create a customized, personal web-based environment — a personal web — that explicitly supports one’s social, professional, learning, and other activities.

- **Semantic-Aware Applications.** New applications are emerging that are bringing the promise of the semantic web into practice without the need to add additional layers of tags, identifiers, or other top-down methods of defining context. Tools that can simply gather the context in which information is couched, and that use that context to extract embedded meaning are providing rich new ways of finding and aggregating content. At the same time, other tools are allowing context to be easily modified, shaped, and redefined as information flows are combined.

- **Smart Objects.** Sometimes described as the “Internet of things,” smart objects describe a set of technologies that is imbuing ordinary objects with the ability to recognize their physical location and respond appropriately, or to connect with other objects or information. A smart object “knows” something about itself — where and how it was made, what it is for, where it should be, or who owns it, for example — and something about its environment. While the underlying technologies that make this possible — RFID, QR codes, smartcards, touch and motion sensors, and the like — are not new, we are now seeing new forms of sensors, identifiers, and applications with a much more generalizable set of functionalities.
6. Digital natives and their everyday engagement with technology

This section further investigates the contention Australian 14-19 year olds are digital natives deeply immersed in the use of digital media in their everyday activities. The depth of this immersion will be established in order to gauge the extent to which this ‘immersion’ will affect design of ICT-related Training Packages and the delivery of applied learning based on qualifications and competencies from these packages.

6.1 Personal use of information and communication technology

Young people in Australia are not only one of the highest users of ICT by young people globally (OECD:2005 38), they are some of the most savvy, experienced and confident users of computers and the Internet.

Significantly, Australian students ranked highest in OECD countries when it came to confidence using the computer whether it be for routine computer tasks (open a file, play a game on the computer, delete/edit/save a files, etc); performing Internet tasks (e.g. get onto the Internet, write and send emails, copy or download files, etc.); or undertaking high level tasks (e.g. use a database to produce a list of addresses, create a presentation, use spreadsheets to plot a graph, etc.) (See Figure 18 below). Unlike most other OECD countries the confidence rating was the same for females or males (OECD, 2005: 46-47; MCEETYA, 2003).

In 2008, over 96% of 15 year olds in Australia have access to a computer and 82% of these households had access to the Internet, 67% of which were broadband connections (OECD, 2005: 18 & 22, ABS, 2008b). With over 68% suggesting they had more than 5 years experience and only 4% suggesting less than one years experience, comparative to other OECD countries Australian 15 year olds ranked first in the world for the length of time they had been using the computer (OECD, 2005:19; Ewing, 2008:v).

Figure 18 - Student uses of ICT for programs and software, Australia and OECD Average compared, 2005

- Word processing
- Spreadsheets
- Drawing, printing or graphics programs on a computer
- Educational software such as mathematical programs
- Help learn school materials
- Programming

![Figure 18 - Student uses of ICT for programs and software, Australia and OECD Average compared, 2005](image-url)
The use of computers by young people in Australia has evolved. How the Internet is accessed and media used is no longer just about using the PC. The computer is now more a tool for homework, high speed Internet access and for running large applications. The following two figures indicate standard activities and their distribution by hours per week.

**Figure 19 - How young people spend their recreation & leisure activities by hour, by week, gender and by living arrangements Feb 2008**

![Figure 19](image1.png)

Recreation and Leisure Activities

(ABS, 2008d)

**Figure 20 - Estimated average hours a week young people spend doing activities, 2008**

![Figure 20](image2.png)

(ABS, 2008c).

The distribution of ‘standard’ activities sets the preconditions as to how ICT is being used by young people.

In general Australia youths reaching ages between 14-19 engage with electronic media and technology mediated communication more than when they were younger.
and decrease their time within non-media activities (e.g. sport, housework) (ACMA, 2008: 62). This is consistent with countries such as the US, Canada and the UK (Livingstone & Bober, 2005). Nevertheless, in many cases, especially for girls, ICT is being used to compliment typical activities (i.e. listening to music and talking). It certainly is not just about using a computer or connecting to the Internet (Ewing, 2008).

As the ABS survey of young people CensusAtSchool below shows in just two years to 2008 a shift away from reliance on the computer is becoming discernable. Other media devices such as mobile phones, MP3 players and games dominate personal use. This confirms the shift from using computers to access the Internet off other devices and playing games on technologies such as game consoles that can also perform other functions (e.g. connect to the Internet).

**Figure 21 - Percentage of students who use various technologies at home (ABS, 2008c)**

Investigation of digital natives shows their use of all ICT on a daily basis follows the following summary graph prepared using ABS data from survey completed by young people at school.
The technology use in Australia can is comparable with international findings from the US.

**Figure 23 - Which media 8 to 18 year olds in the U.S. use in a typical day, 2005**

While the Internet may be listed as the most reliable source of information and an increasingly important source of entertainment, Watching TV and listening to music still rank higher in terms of usage rates and importance (Ewing, et.al., 2008:vi; Rideout, et.al, 2005: 26 & 28)

Australian 14 to 19 year olds are digital natives. On average they have between 4 and 6 media devices in their bedrooms (ACMA, 2008). They are also likely to multi-task, using more than one device at a time. They are what has been termed ‘sensation seekers’ (Foehr, 2006:23), with girls in particular actively seeking
exposure to different technologies while multitasking. They will use their computer daily to:

- Play games
- Communicate using Instant messaging
- Visit web sites
- Email
- Chat
- Use graphic packages

And use the Internet (all networks mobile, fixed and satellite) to access:

- Entertainment (general)
- Mobile phone downloads (ring tones, etc.)
- Music
- Communities
- Educational resources
- Video/Movies
- Online games (AMCA, 2008: 50 & 52; & Rideout, et.al, 2005: 31)

6.2 ICT use and gender differences

In Australia, unlike many other OECD countries (OECD 2008: 201), males and females share very similar patterns of computer use and Internet access. However, it is still critical for engagement of females in ICT related learning that the use of technology be tied to a relevant need and to be accessible on-demand, anywhere, and at any time (Commonwealth of Learning, 2002).

Being connected to other humans and social interaction is critical for girls. Paradoxically, the ‘turn off’ for girls looking at ICT careers has traditionally been this lack of human contact and interaction (Multimedia Victoria, 2004).

Where use differs it is more often due to technology being used as a means to extend traditional activities. For instance 12% of boys and 14% of girls have their own web sites. When it comes to authoring their own web content the trend starts to widen with 38% boys and 47% of girls having completed this activity. But when it comes to social networking websites use patterns for girls is much higher with 41% girls compared with 27% boys involved (ACMA, 2008:66).

The dominant factor determining young peoples’ attitudes towards computers is typically gender. However, in Australia this is not the case. In Australia it was ‘the ability to teach themselves’ was the biggest factor explaining students’ attitudes towards use of computers. This is followed by ‘having a computer at home’ (OECD, 2005: 46-47). Nevertheless, females in Australia, on average, still are underrepresented in computing related higher education degree courses.
Figure 24 – Proportion of higher academic qualifications(1) in computing and all fields of education awarded to females, 2003 (OECD, 2005: 49; MCEETYA, 2003)

Countries are ranked in descending order of proportion of computing qualifications awarded to females.

1. Includes qualifications from theoretically oriented university-level programmes (ISCED 5A) and advanced research programmes such as Ph.D.s (ISCED 6). Excludes vocationally-oriented tertiary programmes (ISCED 5B).
2. Data are for the year 2001.

Source: OECD Education database, Table 3.15.
7. Thinking and Activity Styles of Digital Natives

New generations invariably think and act differently to earlier generations. This is because they each grow up in different circumstances from their parents and respond by developing their own particular forms of identity, values and aspirations. Unlike earlier generations, the digital generation has been empowered by technology in such a pervasive way that we are seeing something new. Their way of thinking, knowing and doing is fundamentally different.

This chapter considers young peoples thinking and activity styles in the context of “new media”, a term presented and used in the US-based MacArthur Foundation (Ito et al., 2008) to capture the broad media ecology young people that experience and participate within. This term is explained in more detail below.

This section examines the thinking and activity styles associated with young people’s use of new media. These are of central importance because:

• A substantial proportion of young people’s time and attention is focused on new-media-related activities;
• Research suggests that some new thinking and activity styles are emerging, and further, that they impact how young people learn;
• Being established in young people’s formative years, new thinking and activity styles appear likely to influence their career expectations, workplace expectations and workplace behaviours;
• There is evidence that, for a number of reasons, the perceived relevance and value of traditional education and training styles for young people is decreasing; and,
• It seems clear that important benefits can be achieved by adapting education and training practices to leverage and productively shape young people’s new-media-related thinking and activities.

In order to make sense of the emerging thinking and activity styles, the following section explains a model for understanding “new media” and three developmental stages and drivers of young people’s new media use. Following this, subsequent sections provide explanations of key activity and thinking styles.

7.1 MacArthur Foundation: Digital Media and Learning Initiative

In 2006, the US-based MacArthur Foundation launched a five year, $50 million ($US) digital media and learning initiative to “help determine how digital media are changing the way young people learn, play, socialise, and participate in civic life” (Ito, et al., 2008:i). They further explain that answers “are critical developing educational and other institutions that can meet the needs of this and future generations”.

Having progressed half-way through this five year initiative, there is now a body of unique and relevant research emerging. Some elements of this are briefly outlined below. However the main element of relevance to this report is the model presented in MacArthur Digital Youth Report (Ito et al., 2008) to explain the stages and drivers of young people’s use of new media. This will be explained below.
What is “new media”?
Prior to elaborating the model, it is useful to explain the concept of “new media” used in this study; MacArthur Digital Youth Report (Ito et al., 2008:8) explain the term and its encompassing rationale as follows:

We use the term “new media” to describe a media ecology where more traditional media, such as books, television, and radio, are “converging” with digital media, specifically interactive media and media for social communication⁵. In contrast to work that attempts to isolate the specific affordances of digital production tools or online networks, we are interested in the media ecology that youth inhabit today. We have used the term “new media” rather than terms such as “digital media” or “interactive media” because we are examining a constellation of changes to media technology that can’t be reduced to a single technical characteristic. Current media ecologies often rely on a convergence of digital and online media with print, analog, and non-interactive media types.

The elegance of this “new media” focus is twofold:
1. It transcends and avoids the tendency to become myopically focused on technologies, thereby taking a clearer and broader view of the dynamics that are influencing young people’s lives and likely futures; and,
2. It transcends the problems that arise from the rapid rate of change in technologies and technology uses.

Technologies and new-media-related practices have changed so quickly that, in many substantive respects, key education and training domains such as educational content and design, pedagogy, qualification and career pathways (amongst others) have been unable to keep pace. Certainly there are many educators, and progressively, groups of educators that have responded in creative and highly effective ways to the rate-of-change-related challenges. However, in terms of a broader approach, it seems clear that getting some sense of the direction and drivers of this change is particularly important.

The model presented in MacArthur Digital Youth Report, 2008, a MacArthur Foundation project, provides a useful set of ideas that can help get a sense of the nature and direction of new-media-related change.

The MacArthur Model: Genres of Participation with New Media
MacArthur Digital Youth Report (Ito et al. 2008:13) explains that the goal of their research as being to “arrive at a description of everyday youth new media practice that sheds light on related social practices and learning dynamics”. The result is a description that focuses around three “genres of participation with new media”; these include:

- **Hanging Out** – using new media to participate in peer- and friendship-centred social activities (e.g. playing games, music, social relationships, flirting and dating).
- **Messing About** – which involves “young people beginning to take an interest in and focus on the workings and content of the technology and media

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⁵ Jenkins H, (2006)
themselves, tinkering, exploring and extending their understanding” (Ito et al., 2008: 20).

- **Geeking Out** – “an intense commitment to or engagement with media or technology, often one particular media property, genre, or type of technology” (Ito et al., 2008:28).

Each of these is outlined in more detail below.

### 7.1.1 Hanging Out

The MacArthur Digital Youth Report (Ito, et. al., 2008:13) point to the coming of age as marking a general shift from childhood family and social relationships to peer- and friendship social groups. Reflecting this, Ito et al. observe that “kids and teenagers throughout all of our studies invested a great deal of time and energy in creating and finding opportunities to ‘hang out’.” In essence, new media becomes integrated into these “hanging out” activities, with the result that young people establish tend to themselves as proficient and innovative users of new media technologies, though primarily within the narrow scope of the social and communication activities they find relevant to “hanging out”.

The research notes that teachers and parents tend not to see “hanging out” as useful or supportive of learning (i.e. a “waste of time”), and that they often place regulations and restrictions on these activities. However, from an overall perspective, these “hanging out” activities can be understood as a new-media-enabled variant on traditional teenage activities directed at forming individual and cultural identity; The MacArthur Digital Youth Report (Ito, et. al., 2008:14) explains:

> Once teens find a way to be together – online, offline, or both – they integrate new media within the informal hanging out practices that have characterised their social worlds ever since the postwar emergence of teens as a distinctive youth culture, a culture that continues to be tightly integrated with commercial popular cultural products targeted at teens. While the content, form and delivery of popular culture (e.g. music, fashion, film and television) continue to change, the core practices of how youth engage with media while hanging out with peers remain much the same. This ready availability of multiple forms of media, in diverse contexts everyday life, means that media content is increasingly central to everyday communication and identity construction. Mizuko Ito uses the term “hypersocial” to define the process through which young people use specific media as tokens of identity, taste, and style to negotiate their sense of self in relation to their peers.

In the context of these overriding social and personal priorities, new-media-related technologies are useful tools whose significance is entirely secondary. It is clear that these formative experiences will shape young people in a variety of ways. However, within this genre of activity, it seems likely that any impacts for education and learning remain substantially latent. This is reflected in the socially-oriented themes that MacArthur Digital Youth Report (Ito et al., 2008) note in relation to “hanging out”; these include:

- **Being “Always On”** - many people have discovered first-hand that mobile phones blur the distinction between being “at work” or “at home”. With the use of mobile phones, people can be contacted, for whatever purpose, at virtually
any time. The MacArthur Digital Youth Report (Ito, et.al., 2008:15) indicate that this “always on” experience tends to be a key feature of young people’s everyday lives, and central to “hanging out” using new media; they explain “teens usually have a ‘full-time intimate community’ with whom they communicate in an always-on mode via mobile phones and instant messaging”.

- **Flirting and Dating** – using new media technologies to pursue friendships and relationships, notably utilising the asynchronous and at-a-distance nature of instant messaging and texting to take time over what they are going to say.

- **Changes to “Friends” and Friendship** – reflecting the use of “Friends” and relationships on social networking sites. Ito et al (2008:18) note that the “development of social norms for how to display and negotiate online friends involves new kinds of social and media literacy”.

- **Relationships with Parents and Siblings** – while social activities tend to exclude parents and siblings, there is some change to dynamics with kids becoming acknowledged experts and teaching parents how to use technologies.

Without pursuing concepts and explanations from developmental psychology, it seems clear that these social and culture-forming activities are essential for young people.

### 7.1.2 Messing About

The MacArthur Digital Youth Report (Ito, et.al., 2008:20) describes “messing about” as a genre of participation in which “young people begin to take an interest in and focus on the workings and content of the technology and media themselves, tinkering, exploring and extending their understanding”. They elaborate further with the following:

> Some activities that we identify as messing around include looking around, searching for information online, and experimentation and play with gaming and digital media production. Messing around is often a transitional stage between hanging out and more interest-driven participation. It involves experimentation and exploration with relatively low investment, where there are few consequences to trial, error, and even failure.

Further:

> The most important factors are the availability of technical resources and a context that allows for a degree of freedom and autonomy for self-directed learning and exploration. In contrast to learning that is oriented toward a set, predefined goal, messing around is largely self-directed, and the outcomes of the activity emerge through exploration.

Features of “messing about” noted by The MacArthur Digital Youth Report include:

- **Developing computer skills**
  
  “Whether it is creating a MySpace profile, a blog, or an online avatar, messing around involves tinkering with and exploration of new spaces of possibilities. Most of these activities are abandoned or only occasionally revisited in a lightweight way. Although some view these activities as dead-ends or a waste of time, we see them as a necessary part of self-directed exploration in order to experiment with something that might eventually become a longer-term, abiding interest in creative production. One side effect of this exploration is
that youth also learn computer skills they might not have developed otherwise. (Ito, et.al., 2008: 25)

- **Discovering and developing interests**
  “Youth invested in specific media practices often describe a period in which they first began looking around online for some area of interest and eventually discovered a broader palette of resources to experiment with, or an interest-driven online group”. (Ito, et.al., 2008:22)

- **A stepping-stone to developing knowledge and/or creative skills**
  “Messing around is an open-ended activity that involves tinkering and exploration that is only loosely goal directed. Often this can transition to more “serious” engagement in which a young person is trying to perfect a creative work or become a knowledge expert in the genre of geeking out. It is important to recognize, however, that this more exploratory mode of messing around is an important space of experimental forms of learning that open up new possibilities and engagements. (Ito, et.al., 2008:23)

### 7.1.3 Geeking Out

The MacArthur Digital Youth Report (Ito, et.al., 2008:2008:28) describe “geeking out” as follows:

*The ability to engage with media and technology in an intense, autonomous, and interest-driven way is a unique feature of today’s media environment. Particularly for kids with newer technology and high-speed Internet at home, the Internet can provide access to an immense amount of information related to their particular interests, and it can support various forms of “geeking out”—an intense commitment to or engagement with media or technology, often one particular media property, genre, or type of technology. Geeking out involves learning to navigate esoteric domains of knowledge and practice and participating in communities that traffic in these forms of expertise. It is a mode of learning that is peer-driven, but focused on gaining deep knowledge and expertise in specific areas of interest.*

In this “geeking out” genre of participation, young people both develop and demonstrate tangible ICT-related skills. They are likely to establish a degree of interaction, contribution and recognition from an online community.

### 7.1.4 Observations: Genres of Participation

Although not all young people will engage in these genres of participation, or progress through them at a particular age, it is useful to observe the following about these genres and their implications for teaching and learning.

- The “hanging out” genre is substantially focused on social activity, and in this context, new media, technologies and the capabilities to use them are entirely secondary. While it may be possible to leverage social and technological aspects of these experiences, particularly in later teens and beyond, the nature of hanging out means it may be continue to be a dynamic area of young people’s activity and growth, and one that may tend to exclude and elude attempts to apply in an educational context.

- The “messing about” genre of participation presents tangible opportunities to shape and nurture young people’s experimentation and exploration with new media. While this would need a lot of attention in terms ensuring appropriate design and flexibility, this form of participation presents clear opportunities to encourage young people to develop their creativity, ability to innovate, online participation in specialist knowledge networks and more. Success in this work
would be indicated by young people increasing their “geeking out” form of participation.

- The “geeking out” genre of participation is likely to reflect the formation of valuable career and workplace skills, particular with respect to innovation, creativity, and collaboration with others, amongst many other things. There is likely to be a diverse range of directions in which young people develop and express these geeking-out level activities. Therefore, for those who attain and can benefit from support in this level of behaviour, more generic skills and support may be most valuable – things that broaden out the foundations of their emerging skills and expertise.

These final two points seem likely to be key areas for accelerating and improving innovation, creativity, new media and ICT skills.

7.2 Key Themes in New Media Thinking and Activity

Some of the key themes in new media thinking and activity, from other research as well as work of The MacArthur Digital Youth Report (Ito, et.al., 2008) are picked out and expanded in the following section.

7.2.1 “Copy and Paste Literacy”

Drawing from the work of Perkel (2008), The MacArthur Digital Youth Report (Ito, et.al., 2008:23) point to the role of “cut and paste literacy” in developing capabilities in the messing about stage. In essence, this involves copying and pasting the work of someone else (e.g. code in a MySpace profile) as stepping stone towards an outcome or developing a personal capability. This same approach is given life in other aspects of young people’s new media activities, most notably in Machinima, which involves editing video and sound from computer games and other media to produce new stories. (Machinima is discussed more below, in the context of creativity).

7.2.2 Fluency in the design-logic of new media devices and applications

A design-logic, very much like a conceptual language, has emerged that applies in a common manner across electronic and new media devices and new media applications. For example, there are “settings” that change how things sound, how things look, and how things work; volumes can be turned up, down, or muted; doing anything usually involves navigating a menu (or a website) to the right place beforehand. This type of fluency could be usefully recognised and accommodated within education practices.

7.2.3 “Self Taught”


The media creators we interviewed often reflected this orientation by describing how they were largely self-taught, even though they might also mention the help they received from online and offline resources, peers, parents, and even teachers.

7.2.4 Content Creators

The 2007 report by The Pew Internet and American Life Project (Lenhart et al, 2007) has found that 64% of online teens ages 12-17 have participated in one or more among a wide range of content-creating activities on the internet, including.
• Share their own artistic creations online, such as artwork, photos, stories, or videos.
• Create or work on webpages or blogs for others, including those for groups they belong to, friends, or school assignments.
• Created their own online journal or blog.
• Maintain their own personal webpage
• Remix content they find online into their own creations

7.2.5 Multi-tasking
Multi-tasking refers to doing more than one thing at a time. In the context this report, it is used to refer to young peoples’ use of new media technologies and/or applications simultaneously, switching attention between them as desired. Many young people have regular multi-tasking experiences like the following:

I multitask every single second I am online. At this very moment, I am watching TV, checking my email every two minutes, reading a newsgroup about who shot JFK, burning some music to a CD and writing this message. – 17-year-old boy (Lenhart, et.al., 2001: 10).

New media multi-tasking is enabled by the convergence of capabilities within electronic devices that enables people to simultaneously pursue multiple needs and desires. For example:
• To communicate (e.g. instant messaging, email, phone, text messages, web);
• To be entertained (e.g. listen to music, watch movies or video, play games);
and,
• To explore, work and learn (e.g. internet browsers, applications).

There seems to be a range of social, psychological and technical reasons why this form of multi-tasking is widespread amongst young people. From a social perspective, young people have a desire to keep in touch with their friends. The MacArthur Digital Youth Report (2008) point to the important role new media plays in the social “hanging out” activities of young people. This will be discussed further in relation to young people being “always on”, below. However, the key point in relation to multi-tasking is that young people are often act to stay in almost constant communication with their friends and peers. The result is that, whether they are listening to music, watching television, writing an assignment, playing computer games, or all of the above, they are still likely to have some form of at-hand communication underway with friends.

It also seems useful to ask why young people engage in multi-tasking from a broader psychological perspective. Jain (2007) identifies a number of possibilities from the work of researchers on the topic:
• The need to be entertained and be connected
  “It plays on the key vulnerabilities for that age-group, which includes the constant need to be entertained, explore their identity and feel connected with peers” (Kelsey 2007).
• Access and availability – an easy distraction from work
  “I think all of us look for distractions in our work and now more than ever it’s possible to type a quick instant message to a friend while you are in the middle of writing a paper” (Teenage Multi-Tasking Researcher, Dr Foehr, in Jain 2007).
• A hunger for sensory inputs
  “In our culture we are hungry for lots of sensation. The possibility of listening to music, watching YouTube, doing homework, and [instant messaging] friends is a way to create an environment that is very rich in sensory inputs” (Dr David Levy, of the Information School of Washington University, in Jain 2007).

• It’s the “In” thing to do
  “Fifty years ago when I was a teenager, there were many advertisements by tobacco companies about how it was very sexy to smoke cigarettes. As a result, many individuals of my generation took up smoking to be sexy and with the in crowd. [The same thing is happening today – electronic devices are marketed in a way that is very exciting and appealing to teenagers” (Dr. David Meyers, Director of the University of Michigan's Brain, Cognition and Action Laboratory, in Jain 2007).

Technology also plays a role in multi-tasking. Firstly, and perhaps obviously, the new media technologies enable multi-tasking. Computers now have the power and range of capabilities to allow a broad range of simultaneous activities. Mobile devices, while not as powerful as computers, are still capable of supporting multiple activities. Interestingly, multi-tasking can also be associated with the limitations of these new media technologies, as indicated by the following comment:

“I do more than one thing at once [while online] because my connection is so slow. If I dedicated my attention to one webpage, I’d go crazy waiting for it to load every time.” – High School Male (Lenhart et al., 2005: 23)

Figure 25 – Multi-tasking – Proportion of time for each primary medium devoted to doing nothing else

(Foehr, 2006: 17)
The Nature of Multi-Tasking
Young people’s multi-tasking behaviour directly affects homework. Homework has also become a magnet for multitasking (Rideout, 2005: 23) and few young people in the US engage in its completion without interacting with more than one technology other than the computer.

Multi-tasking also accompanies traditional activities. But as depicted above few activities receive absolute, dedicated attention.

All day-to-day tasks require a degree of multi-tasking. For example, consider driving a car. At the same time, it seems clear that multi-tasking must eventually reach a level that is detrimental to the performance of tasks. However two key issues emerge for young people:

1. Whether multi-tasking behaviours carry across to young people’s education and learning activities, and have some impact upon the effectiveness of those activities; and,
2. Whether these multi-tasking behaviours persist as people progress from adolescence into their adult and working lives.

There is some speculation that media multi-tasking may be an essential part of how young people are now thinking and acting.

Key Points: Multi-tasking
- Multi-tasking reflects that technology is often the medium and tool for multiple endeavours – for example, communicating with others, entertainment and play, and working to produce something.
- Multi-tasking can be a response to technology limitations – for example undertaking other tasks while waiting for a file to download.
- Mutely-tasking is a style of behaviour and attention likely to have implications for learning and work practices. Used to a self-guided and stimulus-rich environment, perhaps bored easily in other circumstances?
- There is some speculation that media multi-tasking may be a valuable life skill (Foehr 2006:2).
- Multi-tasking is a self-directed activity, with the individual making constant decisions on how to allocate their attention.
- In-class study may suffer as students suffer from a lack of stimulation compared to their highly multi-tasked out-of-study hours.
- Out of class study is likely to suffer as students seek to undertake homework as just one activity within a stimulus-rich multi-tasked home study environment.
- Electronic games that are stimulating and consume a lot of attention, and perhaps useful social interaction for learning and development-related purposes, could be a useful avenue for the development of learning materials. With these features, they may be useful either within or outside the classroom.

7.2.6 Electronic Games

“[M]any games require that youth work together as a team to a far greater degree than when they are working on most classroom assignments. The interactive components of many video games
encourage students to take part in the learning process, which turns passive learners into active ones” (Lenhart, et.al., 2008: 15)

Electronic games use the capabilities of computers (and often also the internet) to present people with opportunities to engage in play for the purpose of amusement or learning. Modern electronic games typically involve problem solving, exploration and learning, trial-and-error strategies, and social interaction involving various forms of competition and cooperation.

Playing electronic games is a major activity of young people. US research indicates that fully 97% percent of teens aged 12-17 play computer, web, portable or console games (Lenhart, et.al., 2008: i). In contrast, many teachers and educators may have little or no experience of electronic games; Sandford et al (2006) surveyed almost 1,000 primary and secondary teachers across England, finding that 72% never played games in their leisure time. Drawing attention to a “generational divide” in respect to computer games play, this same study found that 82% of children reported playing games at least once a fortnight.

While this divide should be expected to diminish as younger “digital generation” teachers enter schools, it seems apparent that some barriers to the productive use of educational games may emerge from:

- The lack of familiarity and experience teachers themselves have with games;
- The potential (and perhaps need) for a different style of teaching with educational games, perhaps with educators taking a less central role in imparting knowledge and evaluating performance.

Beck and Wade (2004) identify a number of ideas, practices and experiences that young people develop through gaming. Although they are not all extensively studied, Beck and Wade (2004) link all of these to business and performance impacts, and the value of gamers as future executives. The ideas, practices and experiences they discuss include the following.

- **“Leaders are basically useless”**
  If there are any leaders in the storyline of a game, they tend to be “irrelevant or evil”. “The game generation believes in skill; they don’t believe in following orders” (Beck & Wade, 2004:154).

- **Self reliance and positive outlook**
  Outcomes depend on the decisions and actions of the player, and this influences how game-players perform work tasks. Beck and Wade suggest that playing games teaches people that things can be made better through their efforts.

- **If you work at it, progress is always possible**
  “The only real limiting factor, always, is your own willingness to keep trying. The only real driver is your own desire to reach some better state” (Beck & Wade, 2004:163).

- **Self-education and problem solving (“learning on the fly”)**
  Games players learn to solve problems through successive approximation, and trial and error. “Games provide countless opportunities to test and re-test different problem-solving strategies immediately and without heavy preparation”. Through this they develop an ability to “learn on the fly”.

- **Failure is a part of the process that leads to success**
  This is related to the point above, though beyond the context of games, Beck and Wade suggest that this becomes part of gamers’ approach to work.
• **Embracing Risk**
  Doing nothing in a game defeats the purpose; games are usually structured in a manner that implies that if the player takes risks, they can gain big rewards.

• **Expect constant change and stimulation**
  Games are designed to be interesting and worth playing. This usually means rich visual effects, music, and sound-effects – in addition to a continual flow of mentally challenging and engaging activities. Beck and Wade suggest that the expectation of constant change translates usefully into gamers’ working lives.

• **Meta-thinking, cognition and analysis skills**
  Game players gain considerable exposure to different perspectives and levels of control, for example from first-person games to those where they manage a town, country or planet. Many games now involve many levels of activity and allow players to explore these different levels and their inter-relationships. Beck and Wade (2004: 167) comment that “By sampling so many different realities, gamers become good at separating the underlying principles from the visible surface. They become analytical and strategic.”

The Realities of Life, Cognitive Dissonance, and Game Design

It is certainly the case that young people can experience and learn a lot from playing games. However this does not mean that all games and lessons will be valuable; there are a number of issues to consider:

• **Life is not a game – Cognitive Dissonance**
  Young people are likely to face situations where the things they have learned in games cannot or do not apply in the real world. What happens in these situations?

• **Game Design**
  To be successful, a game must be designed in a way that provides a constant flow of graded challenges, and is interesting and engaging. What happens when young people are faced with challenges in life that are not like this?

Key Points: Electronic Games

• Research suggests that virtually all teens aged 12 – 17 play computer games.
• Electronic games can be important teaching and learning tools, encouraging active learning and teamwork skills.
• Exposure to games encourages particular ways of thinking and problem solving that are likely to be carried forward through a person’s subsequent education, training and working life.
• From a broad perspective, electronic games seem to imply a different, and perhaps less central role, for educators. However this would depend heavily on the design and purpose of an educational game.
• While playing games may be highly familiar to students, it may leave educators at a disadvantage in due to, (i) their lack of familiarity with playing games (see statistic in the point below); and (ii) potentially being uncertain if and/or how their expertise may be relevant in conducting educational game-related activities.
• In a UK-based study, the majority (72%) of teachers questioned never play computer games in their leisure time. It was also noted that 49% believed that there would be a lack of access to equipment capable of running the games (Sandford et.al., 2006: 16).
Video Gaming is Pervasive in the lives of American teens
Video gaming is pervasive in the lives of American teens – young teens and older teens, boys and girls, and teens from across the socioeconomic spectrum. Opportunities for gaming are everywhere, and teens are playing video games frequently. When asked, half of all teens reported playing a video game “yesterday.” Those who play daily typically play for an hour or more.

Fully 97% of teens aged 12-17 play computer, web, portable, or console games. Additionally (Lenhart et al.: 2008: i):
- 50% of teens played games “yesterday.”
- 86% of teens play on a console like the Xbox, Playstation or Wii.
- 73% play games on a desktop or a laptop computer.
- 60% use a portable gaming device like a Sony Playstation Portable, a Nintendo DS, or a Game Boy.
- 48% use a cell phone or a handheld organizer to play games.

Working together to a greater degree than in most class assignments
“…new media scholars have pointed out the educational potential of a broader group of video games through which players develop valuable social and learning practices. Games scholar David Williamson Shaffer and his colleagues write, “…games bring players together—competitively and cooperatively—in the virtual world of the game and in the social community of its players.” Indeed, many games require that youth work together as a team to a far greater degree than when they are working on most classroom assignments. The interactive components of many video games encourage students to take part in the learning process, which turns passive learners into active ones. “(Lenhart et al., 2008: 15).

Game Affinity as a Universal Characteristic of Workforce and Higher Ed
Experience with and affinity for games as learning tools is an increasingly universal characteristic among those entering higher education and the workforce. A recent survey by the Pew Internet and American Life Project found that massively multiplayer and other online game experience is extremely common among young people, is rich and varied, and that games offer opportunity for increased social interaction and civic engagement among this group. The success of game-based learning strategies owes to active participation and interaction being at the centre of the experience, and signals that current educational methods are not engaging students enough. (Johnson, et.al., 2009: 5)

Educators and Games
Educators are increasingly recognizing the impact of entertainment software and utilizing games as a teaching device in a growing number of classrooms and business settings. In doing so, they are embracing the cultural and technological shifts of the 21st century and expanding the use of a favorite leisure activity, computer and video games, into a critical and still-emerging educational resource. More than just play, entertainment software is now being used to impart knowledge, develop life skills and reinforce positive habits in students of all ages. (Entertainment Software Association)
7.2.7 Creativity and self expression

“... the Digital Age seems to bring about an increasing overlap between creativity, technique and marketing, as is dramatically revealed by the video games sector. This means new occupations, newly ‘needed’ skills and new training requirements, as some studies have suggested. However, only a few countries have confronted this as a necessary challenge and as a sine qua non [i.e. cause] for taking advantage of the potential of the new technologies” (Bustamante, 2004: 806)

Young people have a new and powerful range of tools for creativity and self-expression. In addition, the new and traditional media have presented them with a constant stream of audio and visual content, carrying with them many and varied potentially creative and innovative ideas. One of the most interesting and growing trends of recent times has been for people to take not only the technologies for creating video, audio, and games, but also the content too. Other people’s content has become another resource available for young people in their creativity efforts. This trend is particularly evident in the field of “machinima”, which involves using the capabilities of computer games to present detailed and realistic video, and then editing this together with new voice and sound to tell a new story.

With this type of activity, young people can both gain and demonstrate a broad range of skills. In contrast to writing a story on paper or using a word processor, they are faced with numerous decisions surrounding the visual and auditory presentation of their ideas. It is also interesting to note that, instead of creative stories only being read by a few people (perhaps by the parent and the teacher), many of the creative and electronically-based works of young people can go online to be shared with friends and the public at large. The prospect of peer recognition and acknowledgement (or perhaps a reprise of this) seems likely to become driver for some young people.
8. Teaching the digitally literate: A snapshot of ICT education in schools and factors affecting educators

This chapter seeks to confirm the participation rates in curriculum-based technology education and in Training Package-based vocational education and training (VET) in school; especially Years 11 and 12.

8.1 Participation rates in ICT related subjects

Investigating the research on participation rates in ICT related subjects in Australian schools confirms this has been a quite vexing task. The main barrier is the different labels used across Australia to define subjects (Ainsley, et al, 2008: 36), and how curriculum and VET subjects are treated in that State or Territory.

Ainsley, Kos and Nicholas report, ‘Participation in Science, Mathematics and Technology in Australian Education’ (2008) found technology tended to fall into five clusters; information technology (IT) (or computer technology) technical studies, food and home science, hospitality and agriculture (Ainsley, et al, 2008: 38). IT or computer studies usually had a distinct subject area. Yet IT subjects could occur in VET or education streams. In other cases, as confirmed by anecdotal evidence and comments by teachers surveyed for this report (Interviews, Bowles & Wilson, 2009), some VET or applied learning in IT has been meshed into the general education computer studies classes.

By way of contrast, multimedia seems to find a ‘home’ within Technical Studies or Technology and Applied Studies. Defined as technology design and development, multimedia design or graphics it resides with subjects variously named but usually titled materials and technology (metal, plastics and timber), design and media, textiles and art design (Ainsley, et al, 2008: 36; Board of Studies NSW, 1999). To make matters harder, within schools small enrolments in one of these sub categories may be aggregated up to Technical Studies. This makes it impossible to tie student enrolments to specific technologies associated with print and graphic design, multimedia or broadcast media. Unlike those in the IT subjects, students in technical studies usually complete more than one subject so double counting is often occurring.

The Ainsley, Kos and Nicholas also reported that participation in IT courses decreased from 25 percent of year 12 students in 2001, to less than 15 percent in 2007. In the same period, participation in technical studies for the same group of students in Australia remained steady (Ainsley, et al, 2008: 39, 83). The overall data on participation in ‘technology’ courses is summarised below.
8.2 Models for teaching ICT and technological knowledge

Teaching ICT in a vocational education and training (VET) subject is all too often just seen as developing the student’s ‘know how’ relating to the use of the specific technology. This is a trap. It suggests all technological knowledge simply supports competent use. A one-dimensional view needs to be addressed (Bowles, 2003:165).

Bloom (1956) originally established a ‘taxonomy’ that separates out three main ‘domains’ of learning. These include:

**Cognitive**—concerned with knowledge (acquisition and application), understanding, thinking/creativity and intellectual abilities; for instance:
- Define a term;
- Describe a topic;
- Read a technical drawing.

**Psychomotor**—or performance domain concerned with motor and skills application; for instance:
- Type a letter;
• Drive a car;
• Communicate with staff;
• Develop an x-ray film.

**Affective**—concerned with attitudes, motivation, self-awareness, interests; for instance:

• Show concern for safety;
• Demonstrate sensitivity to problems of the environment;
• Demonstrate lifestyle preference(s);
• Take responsibility for hygiene.

By examining all dimensions to technological knowledge, we begin to reconfirm the importance that ICT education reflects a collaborative process and not a step-by-step one where the teacher merely instructs students on how to use technology. The model shown below reinforces that the teacher is more of a “co-structor” of the learning experience (Blomdahl, 2007). The model comes from the Ministry of Education’s *Technology in the New Zealand Curriculum* (1995) strategy that reformed how technology was being taught in NZ schools.

**Figure 27 - New Zealand Ministry of Education Technology National Curriculum design model (1995)**

New Zealand reviewed these reforms in 2005 (Compton & Jones, 2004; & Compton, 2005). The review suggested that students could only achieve the aim of technology education if the curriculum reflected the need to move beyond ‘functional knowledge’ or ‘user skills’, to encompass the following three strands:

• Nature of Technology (Compton & Jones, 2004) ;
• Technological Knowledge (Compton, 2004); and,
• Technological Practice (Compton, 2005:1).

Technological literacy is the all-encompassing outcome and enabler of the interactions between the three dimensions to technological knowledge that are considered in the New Zealand model.

Achievement objectives and indicators of progression have been identified for each of these three strands. Technological areas and contexts have not been stipulated.
Each Victorian Certificate of Applied Learning has four key elements called curriculum strands:

1. Literacy and Numeracy Skills
2. Industry Specific Skills
3. Work Related Skills

The NZ model reflects the general education or curriculum-based focus. The VCAL approach is unique to their applied learning approach. Both set an important foundation for our study.

If we take the foundation research for New Zealand technology education reforms (Compton 2004:5), we can augment it with findings from the largest industry funded research on e-learning and how it can be more relevant to business needs (Bowles, 2003). This research suggested enabling learning using ICT must focus on the employers desire to build the cognitive and metacognitive requirements of employees or those they seek to recruit. The focus being on how individuals think and learn in new contexts. Three attributes were isolated and highlighted in terms of the design of learning: Knowledge at the personal level; knowledge at the task level, and knowledge at the strategic level (Bowles, 2004:96).

All the above research and investigation for this report suggest we can synthesise the structure of technological knowledge into three main categories of knowledge. These are listed and explained in the following table.

Table 10 Grouping for domains of technological knowledge (Bowles, 2004:96)

| Knowledge relating to applied, procedural or task completion (know how) | Procedural knowledge defines how things are supposed to be done, or in technical knowledge terms, includes how to do things, such as skills or competencies. National units of competency form technical or procedural knowledge validated by an industry or user community that set a ‘standard’ that is codified. |
| Knowledge relating to strategic, technological or affective domain (know what) | This is knowledge an individual has concerning how they should use a device or act. This knowledge underpins what the technology can do and where (context) it can be done in the natural world. |
| Knowledge relating to conceptual or personal cognition (know about) | This knowledge is associated with an individual’s understanding of the way things work together as part of an overall outcome. It focuses on the relationship between a person and their context and between items of knowledge. It may involve theory, or it could be formed from the beliefs and values that guide action in a social or cultural context. |

Will the groupings above adequately cover technological knowledge in a vocational education and training setting?

For vocational courses seeking applied learning, a synergistic relationship has to exist between learning and action (Bowles, 2003: 154). In this sense, applied learning occurs in a situation. Social activity involves learning; every social action involves learning because individuals adapt as they transact with people, technology and their environment. This means applied learning has to be tied to the context of application that may change over time:
The central goal is to increase the capacity of individual learners and the learning of the organizations they are associated with to adapt to a rapidly changing environment. It is a marriage of action with reflection that produces the result. (Dilworth, 1998:6)

The conceptual knowledge domain will, therefore, will have a social context. This is where application of learning will require a social context for how the device and the technical deployment may ‘make sense’ to the user in a range of situations. Technical knowledge should reinforce the social or situated nature of learning.

Most of us experienced formal learning in an authority-based, lecture-oriented school. Now, with incredible amounts of information available through the Web, we find a “new” kind of learning assuming pre-eminence — learning that’s discovery based. We are constantly discovering new things as we browse through the emergent digital “libraries”. (Brown, 2000:14)

Learners have to be active participants in this form of learning, students have to contribute their unique understanding and meaning to the learning process. Their knowledge will invariably draw from the ‘communities’ they belong to and the wider social context.

To reinforce the relevance to vocational and applied learning the three groupings above for technological knowledge should by synthesised as follows:

- Personal knowledge
- Social Knowledge
- Applied Knowledge (Skills)
9. Principles for educators – Engaging the learning habits of digital natives

This chapter seeks to take our investigative research and feedback on classroom practices to suggest some principles that can positively influence how teachers can be helped to better engage digital natives in Training Package-based ICT vocational learning.

9.1 Issues for educators

In undertaking this research project it has been impossible not to acknowledge that no matter how we redesign ICT-related Training Packages, we must be aware of the factors influencing those teaching ICT-related Training Package-based VET subjects, particularly in Year 11 and 12.

9.1.1 Opinions from select ICT teachers

Before we note some of the observations made from investigation of research and publication some important insights can be made from existing practitioners. These help put later findings into perspective.

While this investigative research report had little scope for surveying teachers or educational leaders, a small sample were interviewed. The confidential and semi-structured discussions were intended to provide some qualitative input into the investigative research and to permit the authors to move beyond the international research and Australian reports to get a ‘coal face’ view (Interviews, Bowles & Wilson, 2009).

The interviews included the following individuals.

1. Deanna Hoermann (NSW – Music and advanced learning)
2. Mark O’Leary (Victoria – Music)
3. Janette Bowles (Tasmania – Art and Design)
4. Sonja von Kempen (QLD – computer studies)
6. Daryl Sutton (Victoria – Victorian Curriculum and Assessment Authority)

Key findings from this very thin survey resonate with later findings in this section.

Some of the finds from the interviews included:

- Teachers in multimedia and IT were far more likely to think technology has a stronger influence on how students learn and what they teach in class than teachers of non-ICT specialist subjects that use technology, i.e. music and art.
- Teachers all felt a need for improved ICT professional development opportunities for new and existing teachers across ICT and non-ICT subject areas.
- Delivery of applied learning and VET was enhanced where a good syllabus existed and was separated from general education subjects.
- Teachers were a central player. The success of information, media, multimedia and telecommunication courses all relied on three factors: their capacity to “make the most of poor syllabi”, to posses the technical knowledge and enthusiasm to
challenge students; and to have to skills to teach in a VET rather than curriculum-based subject area.

- Use of ICT by young people was pervasive, and it was not so much a question of how to skill the teachers up to keep pace with the students competence in technology use, rather it was about how to create learning environments where each students’ skills could be harnessed and usefully engaged.

- Everyone thinks they are competent. Teachers often see their competence in using Microsoft Office applications as ICT competence. Students know how to use lots of technology and applications. But their understanding is usually quite shallow.

- The aim is to create an environment where the technology is invisible and the students become so immersed in the activity they really drive the teaching process (Grover, 2008)

One respondent indicated many problems arise from the failure to distinguish teaching of curriculum-based subjects (education) and ICT related Training Packages (VET). This results in:

1) A failure to develop syllabi that permit teachers sufficient scope to teach and assess beyond a rigid, examinable outcome that is oriented to education not applied outcomes;

2) teachers from educational streams not having sufficient VET teaching or ICT skills to effectively deliver applied ICT subjects; and,

3) teachers with limited expertise in the ICT-related subject or in other subjects focus on what they understand and can assess. This results in a focus on using technology rather than creativity or applied outcomes (Grover in Interviews, Bowles & Wilson, 2009).

9.2 Principles for improving student engagement in meaningful ICT vocational learning

Because technology is evolving rapidly and is such a multifaceted phenomena, a multifaceted approach to education is required. Teachers and students differed markedly in their perception and evaluation of ICT in education. Advantages trumpeted by administrators and teachers were often dismissed by students.

The following ten principles emerge from investigative research. They seem to suggest how training for competencies and qualifications from technology-based Training Packages should be designed to engage young people. Each principle has an interrelationship with the others.

All the principles presented herein should be viewed as areas where further research should be conducted.
Principle 1:  **Build a systematic approach to professional development with a specialisation in ICT teaching in a VET subject**

Investigative research confirms the success of engaging young people in ICT vocational subjects and moving into ICT career pathways is dependant on the quality of teaching.

Teachers in IT and technical technology related fields, by comparison with other teachers in secondary schools are:

- Less experienced
- Less specialised in ICT
- Unlikely to have a technical (VET) teaching background
- Rarely bringing to the teaching position some prior industry experience
- Younger
- Engaged in lower levels of participation in professional development
- Less qualified (lower qualifications)

Ainsley, Kos and Nicholas reported in their 2008 report that the median value for the percentage of teachers with more than five years experience in a subject is 58 per cent. They noted that:

> If it is accepted that two years of university study in a field should be a requirement for teaching that field in junior secondary school (that is up to Year 10) then … only one third of information technology teachers would meet that requirement. (Ainsley, et. Al., 2008: 77)

If we want teachers that can encourage the ICT use and learning, we need teachers that can use emerging technologies such as Web 2.0 in the teaching process. This cannot be left to the next generation of teachers (Dolgin, 2009); it requires a systematic and national approach to processional development. This should include not only teachers but the staff supporting teachers (Johnson, et.al, 2008:3).

Principle 2:  **Encourage social interaction**

Speed has accelerated the Internet, broadband connections to home and work. This has been coupled with improved accessibility with mobile next generation 3G and new networks and wireless networks. Together the world of knowledge and collaboration can be accessed by digital natives off their mobile phone. They can “surf the Internet, capture GPS coordinates, take photos, and swap text messages. Just about every kid has an iPod and a personal profile on social networking sites such as Facebook, which lets Net Geners monitor their friends’ every twitch—all the time.” (Tapscott, 2006:3).

Following the work of Vygotsky (1978) and others, it is possible to build opportunities for social interactions into learning. In classroom environments, interactions can be generated easily by teachers and learners. In applied ICT Web 2.0, e-learning or virtual environments the opportunity for interaction exists. Nevertheless, the teacher will need to have activities constructed that create meaningful interaction.
Research and interviews with ICT teaching practitioners maintained that opportunities to communicate and interact with teachers, other students and people external to the learning situation, such as experts or parents, is highly valued by students. Having students participate in networks during the learning process requires new ways of thinking about the role of applied education, and indeed public education.

Rather than thinking of public education as a burden that schools must shoulder on their own, what would it mean to think of public education as a responsibility of a more distributed network of people and institutions? . . . what would it mean to think of education as a process of guiding kids’ participation in public life . . . [beyond] . . . publics that are dominated by adult interests, these publics should include those that are relevant and accessible to kids now, where they can find role models, recognition, friends, and collaborators who are co-participants in the journey of growing up in a digital age. (MacArthur Digital Youth Report, 2008: 39)

**Principle 3: Make ICT learning meaningful and more interesting**

The third principle concerns the nature of pedagogy. Vygotsky (1978), Bruner (1985) and Johnson and Johnson (1986), among others, have long contended that student-centred environments are preferable to teacher-centred ones. Similarly, learning environments can reinforce constructivist pedagogies, where learners are actively and collaboratively engaged in their learning, rather than fed, conduit-like, non-engaging and step-by-step learning experiences.

If teachers, schools and the national approach to VET seek to enhance how young people engage with technology and develop real skills that enhance employability then it is not sufficient to simply foster the ability to use ICT. It is inappropriate to apply industrial-age thinking and classroom structured to digital age practices. Learners need to learn in a context where they are actively encouraged to foster their own creativity and to be innovative (Smith, 2003: 3).

What is ‘meaningful’ and ‘interesting’ seems to have close linkages to the need to refocus on creativity. Teachers that understand how digital natives use ICT, also seem to have the personal capacity to use the new technologies (Grover, 2008). The cultural shift they have made to engage students is reflected in the earlier research presented on avoiding approaches to learning that don’t acknowledge the value of students socialising and playing as part of the learning process (MacArthur Digital Youth Report, 2008: 35).

Investigation of research and recent reports suggest constructivist approaches to learning are being more widely adopted in the teaching of ICT. Such approaches encourage students to become co-participants in the teaching and learning process (Ito, et.al., 2008:39; Smith, 2003:14; & Turner, et al. 1998). This is a big mind-shift and challenges teachers in two fundamental ways:

a) The educator has to breakaway from the traditional role of the teacher as both transmitter and controller.

b) Teachers in ICT must have an especially deep understanding of the core concepts, principles and relationships of the subject being taught (Smith, 2003:29; & Jones 1999).
Yet, investigation shows less skilled the teacher will seek more control. They will rely on what they know and avoid exposing themselves, and therefore their students, to anything they cannot understand or assess.

This is enormously counterproductive as we know the abilities and performance of a teacher and the student’s interest in the subject are a dominant factor in determining young people’s decision to enter into future ICT careers or learning (Multimedia Victoria, 2004)

Principle 4: Control of the learning process needs to be shared

The fourth principle reinforces the need for students to be able to share control. How do you encourage learning in ICT if students have less autonomy and less control over how they use of the same technology than they would enjoy outside the classroom? This is not ignoring the need for teachers to provide structure. It is an acknowledgement of how young people view their loss of control.

With Web 2.0 technologies and peer networks young people have the capacity to engage in opportunities to teach themselves. The approach does offering challenges as to how authentic learning experiences are designed:

> Fluent and expert use of new media requires more than simple, task-specific access to technology. Youth who engaged in a dynamic range of learning opportunities with new media generally had robust technology access, ample time and autonomy to experiment and explore, and a network of peers who supported their new media interests. Sporadic, monitored access at schools and libraries may provide sufficient access for basic information seeking, but is insufficient … (MacArthur Digital Youth Report, 2008: 36)

Principle 5: Accessible and anywhere with the caveat teachers cannot be regulators of behaviour outside the classroom

The fifth aspect relates to flexibility and convenience. Learners’ value delivery that is flexible—flexible in terms of being able to access it just in time, what I want, when I want it. Homework and the simple ability to play with ICT may best occur outside the classroom when the student wants to learn.

This initiative has a strong caveat raised by teachers. Opening collaboration and learning outside the classroom and building a ‘digital bridge’ between learning at school and home has many positive advantages (MacArthur Digital Youth Report, 2008: 38). But teachers are not equipped to regulate or police students’ use of the Internet outside the classroom. Cyber bullying, problems with security, copyright breaches, failure adhere to ‘e-safety’ protocols, and access to pornography were all raised in research and practitioner feedback as areas of concern.

Principle 6: Let students generate their own content and personalise how they access content

What we have earlier called “Digital Natives, young people growing up and living with digital media and technology, like having the power of leadership over parents and teachers in the use of technology. In the past they have been servants to the learning process. They reside in schools that are designed into safe, compartmentalised zones where students still sit in rows or tables. Just as the design of the classroom reflects Industrial Age thinking so does the curriculum. It is
based on industrial age concepts of subject areas that form silos of discipline-based knowledge, and teachers are still seen as sources of authoritative information.

A sheep-dip approach to educational content will not work with students in ICT classes. Engaging younger generations means developing content that can be personalised just like their iPods play list. We can standardise offering but we should not standardise teaching support materials, how content is packaged for a learner or how it is assessed (Johnson, et.al, 2008: 6).

The information, media and communication technologies lend themselves to personalising the learning experience (Grover, 2008); if this is not achieved then students that have real passion in a career in ICT will become frustrated and disillusioned with the learning process (Pearson, 2008).

We have to acknowledge that young people are no longer passive participants in the educational process. As Larry Lessig (2007) the famed ‘lawyer of the Web’ points out kids at home can engage with each other irrespective of global location and “use content, rewrite, reuse or modify it to reflect their experience/world view”. At school they are expected to circumvent this democratised use of the Web and ICT to follow a teacher’s instructions and a standardised approach to learning. Yet young people often see the Internet as a far more reliable source of facts that their teachers (Tapscott, 2009:122). Don Tapscott, founder of the term ‘Net Generation’, suggests that as they ‘grow up digital’ kids process facts, exchange ideas and information at such speeds that they reinvent their knowledge base multiple times.

**Principle 7:** The digital natives will become more restless unless their evolving learning styles and learning preferences are incorporated into teaching practices in ICT subjects

While more research is required in Australia, we need to acknowledge that the everyday immersion in technology and experiences with new media affects the learning styles of digital natives. This investigative research has suggested digital natives generally engage with ICTs as tools to support everyday activities. Activities that young people have been conducting for decades such as listening to music, chilling out, doing homework, and such like. But it is not the use of technology that is the most noteworthy. Investigation has shown it is this very casual acceptance of information, media, and communication technologies and the ability to rapidly repurpose, reuse or multi-task using these technologies that is affecting how digital natives think and act.

Latest educational research suggest “research evidence to date indicates that a proportion of young people are highly adept with technology and rely on it for a range of information gathering and communication activities” (Bennett, et.al., 2009:4). But contention exists over whether there exists a relationship between computer use in activities such as online gaming, social networking and similar Web 2.0 interactions, and learning (Bennett, et.al., 2009:4). But insofar as some have argued there is no empirical evidence that learning styles of digital natives are radically shifting (Bennett, et.al., 2009:4), the application of ICT to enhance learning (e-learning) and the manner with which young people can now engage with ICTs to undertake standard classroom activities (e.g. electronic whiteboards, use of wireless laptops, etc.) is profoundly altering how they want to learn (Bowles, 2004: 99; Cohen, 2001: 356). While teachers have always known instruction has to accommodate the learning styles of different students, we need to make a conscious effort to leverage the capabilities and attributes digital natives are now bringing to the ICT classroom.
Principle 8: Assessment should add value

Assessment continues to be a significant barrier to teachers implementing Training Package-based ICT courses. The assessment process was usually specified in the relevant State or Territory syllabus for schools. While aligned to the national requirements for assessing the units of competency they will differ in method and evidence gathering approaches. Confusion arose between where new technologies, innovative approaches to learning and experimentation could occur and still be consistent with vocational outcomes (Johnson, et.al, 2008:3).

Teachers need to be able to make a valid, reliable and objective judgement as to competence. By way of example feedback from a practitioner provided a typical example of the problems with teachers possessing the skills to assess what is being submitted. (Interviews, Bowles & Wilson, 2009). A student in interactive multimedia had to present an assignment in another class using Microsoft PowerPoint®. This restriction frustrated the student as 40% of the assessable mark was for “creative presentation”. The student taught themselves how to use a ‘bolt on’ application that could automate the ‘blowing up of a pyramid’. The spectacular result was shown to the interactive multimedia teacher who was stunned. Stunned at the originality and stunned as it only scored a marginal pass for creative presentation. The student sought reassurance what they had done was good. Positive reinforcement was ‘creative’. On so many levels this scenario shows how ICT can change the extent to which teachers can actually use assessment to reinforce and encourage students’ engagement with ICT.

In the Digital Age teaching by rote to rigid national exams is a waste of time; worse it disenfranchises young people (Tapscott, 2009: 121-122; & News.com.au, 2008). Teaching digital natives ICT learning using Industrial Age structures and teaching approaches is not sustainable as the technology will always change faster that the curriculum or Training Packages can change. Equally, unless teachers are users and digital natives themselves they cannot work and develop the skills to keep pace with emerging technologies and changing user paradigms.

Principle 9: Encourage creativity and innovation

Innovation and creativity reside behind much of the investigation in this report. Each has aspects that make them closely intertwined with approaches to teaching Training Package-based ICT courses. Ignoring these elements or failing to assess them will reduce the experience for young people and de-emphasise attributes that are highly employable.

Patricia Murphy (2003) in her evaluation of Young Foresight initiative in the UK (http://www.youngforesight.org) identified the pedagogic stance required to support students’ creativity as follows:

- Tasks need to be culturally authentic
- Students share responsibility for learning with teachers
- Students are motivated by dilemmas to which they are emotionally committed
- Learners construct rather than receive meaning
- Intellectual abilities are socially and culturally developed
- Prior knowledge and cultural perspectives shape new learning

Students need to be valued and recognised as participants in the teaching process. Many want to be given the capacity to explore and test the boundaries of what they can do. As one creative student stated “the world is now multimedia” (Pearson,
Video of work 2008) and traditional approaches to teaching interactive media and IT just is ‘too boring’.

We cannot ignore the skills in ICT they have acquired outside what is formally taught in school. The process of engaging young people in ICT has to therefore start with promoting the process of learning and the ‘journey’ rather than the examinable destination:

. . . I point out that individual users can sometimes be more inclined to innovate than one might expect because they sometimes value the process of innovating as well as the novel product or service that is created. (von Hippel, 2005: 45)

Principle 10: Ensure Training-Package based ICT qualifications and competencies set the foundations for employment while not narrowing competence to technologies and careers that will become obsolete.

To have sustainable relevance, ICT related Training Packages do need to establish the foundational knowledge and skills that will promote employability in their specific occupational and industry areas. But technological change and resulting reform of jobs, occupational boundaries and career pathways will evolve faster than national strategies can equip teachers with relevant content and professional development.

Investigation suggests young people traditionally perceive that ICT studies can lead to a wide range of career opportunities. In 2004 a report by Multimedia Victoria (2004:4) indicated a survey of students confirmed:

- 86 per cent agreed that ‘specialising in ICT opens windows to careers in many types of industries or businesses’; and
- 81 per cent agreed that ‘there are a wide variety of ICT careers to choose from’.

While learning ICT was seen as viable, there exists a simultaneous lack of awareness on how specialisation in learning tied to specific ICT and vocational pathways affected career choices (Multimedia Victoria 2004:5).

Principle 11: Competencies need to improve employability while opening pathways to current and future ICT careers in many industries

ICT educators universally struggle with the concept of what work opportunities they are preparing their students for. ICT spans both the sense of individual creativity, technical know-how and vocational preparation. In the school setting the pendulum continually swings between an emphasis on applied outcomes required by industry and the academic outcomes being sought by the school and universities (Gawith, et. al. 2007; & Grushka, 2004: 17).

What students need is a clear link between the learning and their future careers. The more it narrows opportunities the more it may appeal to digital natives wanting to ‘mess about’ with the related technologies. But this is atypical. Most want to experience a range of sensations hang about with others and experiment. The appeal of ICT is diminished for the bulk of students if ICT requires early specialisation into narrow fields of technical application.
Learning in ICT needs to build broad skills for entry into a range of vocational options in ICT. These may not be limited to one industry area.

This investigative research report suggests the combination of applied skills in combination with the ability to think, be creative, solve problems and learn is required to make a student employable in the labour market. Advancing broader entry-level vocational training should be linked to career opportunities. The following should be actioned in conjunction with any revisions to how ICT related career information is provided in support of Training Package qualifications:

- There is information provided in the digital space that gives absolute clarity to the nature of the career opportunity. The nature of the opportunity needs to be described so young people know how they get there and this is directly tied to the design and packaging of the qualifications they can access;

- Career information has to realistically consider and provide options that address concerns all careers in IT, multimedia and telecommunications are boring and involved sitting in front of a computer all day without human interaction. This is a particular turn-off for young women when making career choices (Multimedia Victoria 2004:5).

- In support of the above point, illustrate how the ICT industry and the learning processes will use interactive media and Web 2.0 sites (Facebook, myspace). This will confirm to girls (or to a less extent males) that are ‘turned off’ by ICT careers because they seem to lack human interaction.

- The quality of ICT teaching, the content of courses, and the range of choices available has to inspired and persuaded young people that ICT-related study does not narrow choices or prevent study in areas where they have a strong interest.
10. Revisiting IBSA technology-related Training Packages: Skilling and engaging Digital Natives

This chapter will seek to outline findings made into the current design and construction of ICT-related Training packages and Qualifications. The findings represent a synthesis of investigative research that has uncovered not only the nature of the digital landscape in Australia, but also how young people are engaging with ICT in the daily lives and how this will impact applied learning.

10.1 Findings on how to improve the flexibility of current ICT-related Training Packages

Finding 1: The way Training Packages are designed and reviewed is not conducive to promoting entry-level applied ICT vocational education and training that is responsive to change.

Training Package qualifications are tied to vocational outcomes. They include competencies that form the skills and knowledge profiles for an occupation and activities related to specific job families. ICT is changing how occupations and jobs are constructed. New jobs are emerging, old ones mature and evolve or disappear, and others simply merge across boundaries that had artificially classified them into an occupational stream or industry area.

ICT is also a foundation to life and work across most occupations and industries.

While all the IBSA managed ICT-related national qualifications, competencies and skill sets have relevance to work, that relevance is transient and the more general competencies or those specifically tied to use of a defined technology or process will evolve and change far more rapidly than the reviewed structure of a Training Package can cope with. This supports the contention that if qualifications in Training Packages are designed around certain jobs rather than generic tasks, i.e. change “the job-based” premise, rapid change will make it cost prohibitive to continually resource the review and update process (Hoeckel, et.al. 2008: 8).

Finding 2: The information contained in the ‘Technology’ section of employability skills has little real relevance.

In their report *A study into the assessment and reporting of employability skills of senior secondary students*, Gabrielle Matters and David Curtis stated:

> Traditional definitions of the five evaluative criteria—validity, reliability, objectivity, feasibility and usability—were found wanting when they were applied to those assessment approaches identified as possibilities for employability skills. (2008:ii)

This statement is echoed in this investigation. While not seeking to discount the importance of employability skills, their implementation could be significantly improved with respect to technology (Hoeckel, et.al. 2008: 38).

An employability skills summary is included for each qualification. These summaries are intended to indicate employability skills at the qualification level and for each of the key aspects—Communication, Teamwork, Problem solving, Initiative and enterprise, Planning and organising, Self-management, Learning,
Technology — and thereby capture the key aspects or facets of the employability skills that are important to the job roles covered by the qualification. The standard guide to employability skill for the technology component is as follows:

<table>
<thead>
<tr>
<th>Technology that contributes to the effective carrying out of tasks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• having a range of basic IT skills</td>
</tr>
<tr>
<td>• applying IT as a management tool</td>
</tr>
<tr>
<td>• using IT to organise data</td>
</tr>
<tr>
<td>• being willing to learn new IT skills</td>
</tr>
<tr>
<td>• having the OHS knowledge to apply technology</td>
</tr>
<tr>
<td>• having the appropriate physical capacity.</td>
</tr>
</tbody>
</table>

The existing approach gives little or no indication of wider dimensions to knowledge that will underpin technological competence as it would “contribute to the effective carrying out of tasks”. The approach to defining technology in ‘Employability Skills’ for ICT qualifications is often too narrow.

Examination indicates some ‘Technology’ facet descriptions from the range of ICT-related Training Package qualifications are so broad that they can only vaguely support their intended role of informing employers and educators as to how attainment of a competency will improve the individual’s employability. Some are simplistic, some don’t change across levels of competency, while all still reflect on use, even where the other 7 components in the Employability Skills Framework fail to elaborate on such things as technological literacy or cognition.

**Table 11 - Technology facet to Employability Skills in ICT-related Qualifications**

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Technology facets extracted from Employability Skills for each qualification</th>
</tr>
</thead>
</table>
| CUF10107 Certificate I in Creative Industries & CUF20107 Certificate II in Creative Industries (Media) | • using the Internet to source information  
• sending emails |
| CUF30107 Certificate III in Media | • managing files using standard naming conventions  
• using content management systems, authoring and digital imaging software  
• using link-checking software  
• using video and audio software to prepare video and audio sequences for inclusion in interactive media products |
| ICA10105 Certificate I in Information Technology | • using personal computers and applications such as word processing, spreadsheets, databases and presentations |
| ICA20105 Certificate II in Information Technology & ICA30105 Certificate III in Information Technology | • selecting, installing and using computer software and hardware |
| ICT20208 Certificate II in Telecommunications & ICT30208 Certificate III in Telecommunications | • Installing and operating telecommunications equipment and products |
| ICP20105 Certificate II in Printing and Graphic Arts (General) | • operating machines such as folders and lithographic printers  
• using computerised control, monitoring and data entry systems  
• using information technology such as computer hardware and software to access data from files |
| ICP20205 Certificate II in Printing and Graphic Arts (Desktop Publishing) | • using computerised control, monitoring and data entry systems  
• using information technology such as computer hardware and software to access data from files |
| ICP30305 Certificate III in Printing and Graphic Arts (Multimedia) | • applying multimedia platforms and computer systems when producing multimedia products  
• using computerised control, monitoring and data entry systems  
• using information technology such as computer hardware and software to access data from files |
Finding 3: Requirements for students to choose a career pathway and specialisation in Year 10, before undertaking prevocational or Certificate I to III qualifications in Years 11 and 12, is counterproductive to a sustainable approach to making young people more employable.

CUF07 Screen and Media & ICA05 Information and Communication Technology have Certificate I qualifications that involve ICT use and application that the digital natives would have learnt in primary school. Only as these qualifications progress into Certificate III selections does the specialisation really become tangible, for instance in broadcasting (CUF30207 Certificate III in Broadcast Technology, CUF30107 Certificate III in Media and elective streams in ICA30105 Certificate III in Information Technology).

The Training Packages ICP05 Printing and Graphic Arts and ICT02 Telecommunications commence at Certificate II. Unlike the previous two Training Packages, the qualifications at Certificate II and III are far more heavily oriented to specialisation in industry-specific career streams. While a general telecommunications entry Certificate II exists, there are also specialisations in cabling, access network cabling, and digital reception technology. These qualifications have a specific place in the industry career pathways and do have some appeal as numbers do complete these as VET in school. However, their real application is as part of a traineeship or apprenticeship model, whether that starts in school or as the students moves into work and learning after Year 10.

The Printing and Graphic Arts suite of Certificate II and III would represent a challenge to a digital native that wants to broaden their experience, skill and knowledge. There exists a range of Certificate II and III qualifications that reflect industrial and occupational pathways that do require students to make firm choices. The limitations in numbers, steadily declining enrolments, and seeming difficulty for school systems to resource such a range of specialisations should argue strongly for Printing and Graphic Arts to pursue a more integrated, broader Certificate II and perhaps a Certificate I qualification that is better suited to young people not seeking a specialist trade. The design may follow the principles later outlined in this report.

As a basis for what should be in any revised, broader printing and graphic arts entry-level qualification, no better base contrast exists than an examination of two existing qualifications in the Training Package. While the Training Package is heavily oriented towards technical-specialisation, investigative research and initial analysis confirms that multimedia or interactive design is a major growth area in VET in schools and among students undertaking pre-vocational or applied learning. This has most often been aligned to ICP20205 Certificate II in Printing and Graphic Arts (Desktop Publishing) and ICP20105 Certificate II in Printing and Graphic Arts (General). Yet very strong opinions were received in interviews from teachers expert in teaching multimedia that the interest in the subject was only if the outcomes were not tied to just ‘printing and graphic art’ industry pathways, but also to pathways that also led to vocations in industries such as IT, interactive and screen media, or creative arts. The very appeal of the subject was the capacity to make it enhance broad employability; not the printing industry specialisation.

Comment was received on how the Certificate III in Printing and Graphic Arts (Multimedia) was an ideal point for building cross industry relevance, yet the course itself “required highly capable teachers to make the most of it in a world of interactive and digital media” (Interviews, Bowles & Wilson, 2009).
The need for early specialisation should be challenged. A broad based entry point could be developed that spans information, media and communication technology. At the entry point, the power and relevance of understanding ICTs in a broader context than one industry is essential. This will also help young people develop more resilient career options.

Finding 4: **ICT-related Training Packages need to be reviewed to establish whether competencies relating to technology use that were seen as entry-level requirements 2-5 years ago have become skills and knowledge young people typically acquire by the age of 15 and therefore place no value on as part of post-compulsory education.**

A study of the digital landscape and daily usage patterns clearly indicate that standard requirements for entry into ICT-related careers are no longer suitable for coverage at Australian Qualifications Framework 1-3 levels.

Research and feedback on classroom practice highlighted that the decline in enrolments in ICA05 Certificate I and II was being ascribed in some part to boredom through the students existing competence and the inability of a teacher to ‘stretch’ students and make the subject more challenging and interesting. For instance an examination for *ICA20105 Certificate II in Information Technology* shows there are 8 core competencies and another 6 are required to obtain the qualification. A detailed examination of each core competency confirms three are quite generic and common to multiple contexts (the first three listed below). The other 5 offer no substantial challenge or applied interest to the vast bulk of digital natives who would see these as essential life skills:

- BSBCMN106A Follow workplace safety procedures
- ICAW2001B Work effectively in an IT environment
- ICAW2002B Communicate in the workplace
- ICAD2012B Design organisational documents using computing packages
- ICAU2005B Operate computer hardware
- ICAU2006B Operate computing packages
- ICAU2013B Integrate commercial computing packages
- ICAU2231B Use computer operating system

The observations made for ICA20105 have relevance to most of the Certificate I and II, and many Certificate III qualifications reviewed during the writing of this report.

Finding 5: **To promote retention, pathways into further ICT-related work and careers, common competencies need to be identified across the Training Packages.**

When constructing a matrix of qualifications below Certificate III for the four ICT-related Training Packages that are the focus for our study, one is struck by the seeming loss of opportunity to identify common competencies. Common competencies are important to employers because they promote the skills and knowledge an individual can deploy when moving laterally across jobs or occupational domains. They can also provide the knowledge necessary to underpin activities typical to more than one job role or level of competence.

*Flexible Packaging of Technology Training Packages*
Promoting common competencies across the Training Packages would support the previous point on the need to overcome specialisation and improve employability.

The following list provide headings of areas where common competencies should be authored from existing competencies in use at Certificate I and II and, to a decreasing extent, at Certificate III:

**Generic across all Training Packages**
- Industry knowledge
- Communication
- Occupational Health and Safety/Environment, Health and Safety
- Working with others
- Use a computer
- Quality of work
- Financial literacy
- Manage self

**Specific to ICT environment**
- Access the Internet/retrieve information
- Using a Web browser and email
- Develop a design concept
- Create and test a CD-ROM/DVD
- Capture an image
- Connect and maintain peripheral hardware
- Use a computer operating system
- Install software

**Finding 6: Technical teachers delivering ICT-related qualifications in schools need support materials, especially with respect to assessment**

Problems with the lack of a national assessment have recently been raised as possibly causing inconsistencies as to whether “a particular set of skills has in fact been acquired.” (Hoeckel, et al, 2008:34) This problem is being compounded when ICT-related qualifications from Training Packages are delivered under syllabi designed and developed by States and Territories. Each teacher delivering these subjects has to not only meet requirements set out in the Training Package, they often are obliged to run standardised Years 11 or 12 school certificate (HSC/VCE) exams and report assessment against set criteria (e.g. Board of Studies, NSW:1999:47-48).

In examining the image below showing the ‘current state of play’ with respect to assessment models in Australian schools, the obvious question is, “Where does Training Package-based VET in schools reside?” It should have national consistency and control. Standardisation should be very high. But assessment is not external; only the formation of the competency standards is external. By any consideration of the matrix of control versus standardisation, the relative position of assessment processes and tools for Training Package-based courses and competencies is uncertain.
The technical teaching of ICT in a school or applied pre-vocational context is not being well met by the traditional resources supporting Training Packages. Teachers need lesson plans, less complex and more relevant assessment plans, tools, samples and templates. While acknowledging the cost of maintenance, advice and comment on qualifications should be provided as mini-professional development modules. Such modules could support the knowledge and skills required by teachers to translate an ICT qualification from its workforce and Registered Training Organisation context to a context dominated by in-school or recent school leavers aged between 14 and 19. Placed into interactive environments, the Resource and Learning Objects (RLOs) could be supported by Web 2.0 tools that promote comment and communication between teachers.

**Finding 7:** To an employer, competence in the use of ICT is not the sole determinant of ‘employability’.

The design and configuration of the ‘Technology’ component of the ICT-Training Packages adds no value to any issues relating to the education and later employment of an individual successfully completing units of competency, skill sets or a qualification.

The Australian Chamber of Commerce and Industry has consistently argued that with 70% of students not progressing onto university after post-compulsory education and training, the relevance of schools in promoting VET and employability for jobs was essential (ACCI, 2003; ACCI, April 2008; Matters. & Curtis, 2008). ACCI does not suggest employability resides in focussing on applied skills or just integrating structured workplace learning. Rather the emphasis is on broader cognitive and metacognitive skills such as “problem solving, critical thinking and creativity, analysis of the impact of actions, and communication and teamwork” that foster not only individual employability as well as building the skills required for innovation (ACCI, July 2008:8).
The relevance of interactive multimedia studies was born out by classroom practitioners. In two interviews teachers suggested the rise in interest in the subject was not just because it was interesting to 14-19 year olds, but also due to the belief shared by students that it broadened available career pathways (Interviews, Bowles & Wilson, 2009). One teacher confirmed that a major relationship with an employer was based on the fact they actively recruited students from the school's multimedia program because:

*We teach how to not only use the technology like Flash, Director, Adobe Photoshop, they can think creatively and work together. [The company] know this is the difficult thing to teach and they can always train employees to use software. Anyway [software] changes so often in this industry [that the need for software training] is expected.* (name of company removed. Grover in Interviews, Bowles & Wilson, 2009)

**Finding 8: To a digital native, immersion and competence in the use of ICT is not a precursor to a career in ICT.**

Investigation has uncovered no direct evidence to support the belief that increased use of ICT will naturally lead digital natives to careers in ICT. The profound advance in young people's skills and knowledge in ICT use and their acceptance that ICT will underpin most activities in life, learning and work offers the ICT industry a huge opportunity to engage with young people that want a viable career pathway. The link between use and ICT career pathways can be leveraged if the following are observed.

- An increased number of young people accept the value of ICT as a base-competence required for entry into any career. This increased engagement with ICT subjects does represent an opportunity for the ICT industry to access a larger recruitment pool;
- Increased use of ICT does not naturally lead young people to value their ICT skills. The ability to show young people the vocational value of what they can do does offer a potential means to attract young people from Training Package-base learning and ICT careers.
- Digital natives don't have to be convinced of the durable nature of ICT skills. They have to be convinced of the sustainable nature of a pathway into specific vocations where the ICT skills dominate pay and progression.
- Some young people like to 'geek out'. They are passionate about certain ICT applications and hardware. These young people cannot go through 'sheep-dip' ICT courses and be expected to translate their passions into a career.

Digital natives seem to want career choice. Early specialisation in ICT subjects may only suit those seeking to 'geek out' but only if it taught by experts, has leading edge relevance and will lead to a job in their area of interest.

**Finding 9: Show industry support and the legitimacy of career pathways through the use of brands.**

Educators are often deeply suspicious of commercial interests becoming involved in the educational process, at any level. Without having investigated ethical or legal issues, we need to acknowledge digital natives are consumers. They engage, compete and compare using brands. While we may talk of Web 2.0, social networking, or interactive media, multimedia, IT and telecommunications, all these subjects are respectively dominated by brands such as, Google or ninemsn, Myspace (News Corp.), Adobe, Apple Macintosh, Microsoft, and Cisco or Telstra.
Courses that reinforce employability across multiple ICT career pathways and are relevant to employers could be branded. Digital natives brand associate. This is especially evident for those young people that are moving from ‘messing about’ to ‘geeking about’ with an application or hardware. They buy and consume brands. Brands become icons and icons represent commercial success. To attract young people into ICT that has a real vocational pathway, brands of recognised ‘icon’ companies can say this far better than a Ministerial statement.

Moreover the ‘brand’ companies and other employers can make a real contribution to ensuring the skills and knowledge being taught is contemporary with future learning and work needs. They can also provide real support to the conduct of competency-based assessment and the conduct of workplace learning.

10.2 Options for a more flexible and relevant entry-level ICT-related suite of qualifications

Initial findings and design principles from this investigative report suggest three options exist to make ICT-related Training Packages more effective for young people, especially those in Years 11 and 12, VET in school and applied learning streams.

Doing nothing is not an option.

Note all discussion and suggestion as to title for the qualifications, strands or competencies are, by no means, absolute. The detail is provided to assist informed discussion.

10.2.1 Option 1: Improve the existing Training Packages and qualifications

Under this proposal the principles, findings and overall research and feedback from teachers would be utilised to improve what currently exists. This option is likely to cause the least disruption.

The review would almost certainly require the following steps:

1. Review of common competencies across all the ICT-related Training Packages
2. Revise existing competencies
   a. Update competencies to remove aspects that accelerate their redundancy as technologies or practice change
   b. Update critical aspects of assessment for each competency
   c. Confirm relevance to AQF level and career pathway
3. Develop new competencies to replace or address ICT change
4. Revise and update all national learning and support materials and resources.

All actions would be consistent with the current Training Package Development and Endorsement Process 2008 and be endorsed according to DEEWR (2008) Training Package Development and Endorsement Process.

Improvements could be undertaken as part of ongoing Training Package review processes. However, the most positive outcomes would occur if all packages and
Certificate I – III qualifications were reviewed at the same time. This would ensure improvements that require a consistency of approach across all four packages were properly addressed.

10.2.2 Option 2: Add a cross-industry ICT-specific suite of qualifications
This option would result in a purpose-designed Certificate I and II, and perhaps, Certificate III that would each address cross-industry entry into ICT-related industries and occupations. Certificates could be titled ‘Information, Media and Technology’. The proposed qualifications would be in addition to what exists now.

All actions would be consistent with the current *Training Package Development and Endorsement Process 2008* and be endorsed according to DEEWR (2008) *Training Package Development and Endorsement Process*.

During the design and development stage of the new entry-level qualification(s), no change would necessarily occur to existing Training Package qualifications. Over time, however, some qualification may be phased out and replaced with the broader based entry qualification.

Just as with Option 1, a review and renewal of existing competencies would have to occur to optimise the integration of the new, with the old, wherever possible. While more disruptive than Option 1, this option would be consistent with standard industry practices.

While the timeline for completion of this investigative report is too short to give a comprehensive analysis and suggestion for course structure and competencies, the following may be provided as a formative point of reference.
### Certificate I in Information, Media and Technology Skills

#### Core competencies

- Develop and apply industry knowledge
- Participate in OHS processes
- Determine and follow requirements for using information and communication technologies and systems
- Determine and follow agreed work practices and processes
- Work effectively with others
- Determine and evaluate technological ideas and outcomes
- Develop and communicate outcomes enabled by the use of technologies
- Develop and articulate concept for own work

#### Elective competencies

##### Digital media

- ICPMM321B Capture a digital image
- ICPPP311B Develop a detailed design concept
- ICPPP325B Create graphics using a graphics application

##### Digital and Graphic Art

**General:**
- ICPPP211B Develop a basic design concept
- ICPPP221B Select and apply type
- ICPPP224B Produce pages using a page layout application
- ICPPP225B Produce graphics using a graphics application
- Capture, edit and produce a final image

**Multimedia specific:**
- Create content using multimedia
- Capture and store digital asset (audio, image or video)
- Create webpages with multimedia
- Develop a multimedia script
- Apply principles of visual design and communication to the development of a multimedia product
- Create 2D digital animation/Produce an interactive media sequence

##### Information Technology

**IT Specific:**
- Use information technology
- ICAU2013A integrate commercial computing packages
- Use software to complete work outcomes
- Maintain equipment and consumables

**Programming and software specific:**
- Use and apply digital tools and applications to produce and present information
- Confirm data representation and develop basic computer programming skills
- Use programming skills to solve a problem, and to develop and refine a solution
- Apply comprehensive knowledge of data structures to produce a solution

##### Telecommunications and networks

**Computer/work networks:**
- Apply basic networking concepts
- Perform basic network and system maintenance
- Identify the Application Layer, the Internet and its applications
- Use different digital networks to access, retrieve and deliver information in support of work processes
- Examine and establish the feature of different data communication standards and solutions

**Communication networks:**
- Examine different telecommunication networks and transmission mediums
- Relate Communications Basics to different transmission systems
- Establish the configuration and uses for different electronic switching networks
- Configure Video Transmission equipment

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Drawing on recent reform in New Zealand to digital media within the national technology curriculum (Ministry of Education, 2008), a set of additional or alternative elective streams may include:

- Digital environment and information systems;
- Electronics and control;
- Business technology;
- Software production and services.
### Core competencies

- Use a range of software to enhance work outcomes
- Operate integrated information and communication technologies to complete work outcomes
- Follow OHS and environmental policy and procedures
- Apply knowledge and skills in a range of activities, demonstrating comprehension of relevant principles and systems
- Perform and evaluate work to agreed quality standards
- Work with others to resolve problems
- Develop creative and original responses to problems and technical requirements

### Elective competencies

#### Digital media

<table>
<thead>
<tr>
<th>Media/broadcast specific:</th>
</tr>
</thead>
<tbody>
<tr>
<td>CUFRES201A Collect and organise content for broadcast or publication</td>
</tr>
<tr>
<td>CUFPP05201A Perform basic vision and sound editing</td>
</tr>
<tr>
<td>CUSSOU04A Record sound</td>
</tr>
<tr>
<td>CUSSOU09A Mix sound sources</td>
</tr>
<tr>
<td>CUFSOU204A Perform basic sound editing</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multimedia specific:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop creative and innovative solutions to a multimedia challenge and need</td>
</tr>
<tr>
<td>Write content for a range of media</td>
</tr>
<tr>
<td>Prepare and produce digital assets using multimedia</td>
</tr>
<tr>
<td>Convert and integrate digital files for use on a range of media</td>
</tr>
<tr>
<td>Test a multimedia product</td>
</tr>
</tbody>
</table>

#### Digital and Graphic Art

| CUVCRS05B Use typography techniques for design work |
| CUPPM322B Edit a digital image |
| CIPPPP211B Develop a basic design concept |
| CIPPPP221B Select and apply type |
| CIPPPP224B Produce pages using a page layout application |
| CIPPPP225B Produce graphics using a graphics application |
| CIPPPP252B Output images |
| CIPPPP311B Develop a detailed design concept |
| CIPPPP324B Create pages using a page layout application |
| CIPPPP395B Transfer digital files |

#### Information Technology

| IT Specific: |
| Review and confirm possible advantages of IT advances |
| Establish and perform system backup and security checks |
| Perform routine maintenance |
| Perform data analysis |
| Maintain system documentation |
| Use advanced software |
| Apply database concepts |

| Programming and software specific: |
| Install and configure software |
| Establish process and procedures for software integration |
| Compare computer operating systems |
| Identify the application environment/interface for given languages |
| Apply the principles of data analysis for computer systems |
| Explain the software development lifecycle |
| Design and develop a basic programme |
| Test and debug a programme |

#### Telecommunications and networks

| Verify and validate requirements for a network |
| Install and configure a basic digital network |
| Develop detailed design documents |
| Identify requirements for system implementation |
| Determine security requirements |
| Develop and test a prototype network solution |

| Build a small LAN |
| Install, maintain and modify communication cabling |
| Set up and locate a communications link |

Note that in the above formative design, the multimedia elective stream has been formed into an articulation point between either CUF07 Screen and Media or the ICP05 Printing and Graphic Arts Training Packages.
10.2.3 Option 3: Add an applied learning suite of qualifications
Option three would involve moving away from standard approaches and practices inculcated into the existing ICT-related Training Packages. While all competencies and materials can be authored and endorsed consistent with national requirements, neither the competencies nor the resulting qualification would be tied to an industry or a defined vocational pathway linked to an occupation or job family.

Option 3 is the most disruptive to the current approach to implementation of Training Packages and accepted practices.

Option 3 best incorporates the findings made in this investigative research report.

The aim of Option 3 is to optimise relevance while leveraging what will engage young people in not only learning to use technology, but also in translating technological competence into a desire to move along a pathway into an ICT career or further learning.

The design and approach to the new information, media and technology applied learning qualifications and competencies would be more consistent with curriculum and accreditation processes used for vocational education and training designed and developed by state education systems.

Unlike current qualifications and competencies, this proposed qualification and competencies learning would not be tied to a specified work outcome. It is not about using a specific range of technologies. Learning must have relevance across multiple technologies, activities and possible work contexts. The competencies guide both standards of required performance and what is employable in the industry. Schools, teachers and students have maximum opportunity to design and develop programmes that reflect their specific needs. This includes flexibility on which ICT areas and contexts will be covered.

The assumption in this approach is that the student has a base level of technological competence and literacy. Technological literacy must evolve through completion of the qualification but the need to learn to use a computer or the Internet is de-emphasised. It is no longer just about ‘doing things with a computer or technology’ it is about personal and social knowledge that can be transferred to multiple technologies and work contexts.

The approach will have implications for how Training Package-based ICT learning is delivered to young people. Applied learning will build the scaffolding to enable each student and community of learners to engage in technological practice, contribute their innate capabilities while developing their technological knowledge and applied competence. Technological literacy acknowledges that students will need to gain depth as well as breadth of theory and skills. As ‘sensation seekers’ (Foehr, 2006:23) the predilection of digital natives is to multi-task and process volumes of information in great breadth. What is often lacking is depth or understanding and theoretical constructs to make sense of the new or to solve problems. Students need the conceptual and social knowledge necessary to build competence beyond their own technological practice.

The strands of learning are not required. This is because the competencies are directly aligned to the national Employability Skills Framework, rather than an industry or occupation. Each competency is written to ensure the qualification provides a more appropriate coverage of all three aspects of technological
knowledge. This approach incorporates all the principles and findings of this investigative report. Specifically the design will address:

- The need to promote vocational outcomes that are broad but not specialised too early to a narrow range of technologies or career pathways;
- Adds weight to employer calls for ‘employability skills’ and the cognitive and metacognitive skills required, not just the skills to use technology
- The scope to use different approaches to learning, the context or learning and the technologies involved
- Encourages specialisation within the learning process that will encourage student engagement but not limit their career choices within the ICT industry
- Applied learning will lead to applied competence.

The following conceptual layout acknowledges that units of competency will be situated in strands that ensure full coverage of all aspects of technological knowledge as modelled in earlier in this report (see Chapters 7, 8 and 9). Note earlier caveats over the time and capacity of this research report and that such information can be little more than indicative rather than substantive.

The shaded areas indicate where the competency aligned to one of the employability skills also should be written to meet one of the three dimensions to technological knowledge.
## Certificate I in Information, Media and Technology

<table>
<thead>
<tr>
<th>Employability Skill</th>
<th>Competencies</th>
<th>Technological Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication</strong></td>
<td><strong>that contributes to productive and harmonious relations across employees and customers</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Communicate effectively using a range of digital media</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Find and retrieve information using a range of networks and applications</td>
<td></td>
</tr>
<tr>
<td><strong>Teamwork</strong></td>
<td><strong>that contributes to productive working relationships and outcomes</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Work with others to achieve a common goal</td>
<td></td>
</tr>
<tr>
<td><strong>Problem solving</strong></td>
<td><strong>that contributes to productive outcomes</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Establish and confirm solutions to overcome standard problems and issues that affect task completion</td>
<td></td>
</tr>
<tr>
<td><strong>Initiative and enterprise</strong></td>
<td><strong>that contribute to innovative outcomes</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Explore how the creative use of digital technologies has affected society and work</td>
<td></td>
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<tr>
<td></td>
<td>Examine and apply the principles of visual design</td>
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</tr>
<tr>
<td><strong>Planning and organising</strong></td>
<td><strong>that contribute to long and short-term strategic planning</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Plan and complete all processes and stages required for a select activity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Establish the procedures and quality requirements affecting completion of a task</td>
<td></td>
</tr>
<tr>
<td><strong>Self-management</strong></td>
<td><strong>that contributes to employee satisfaction and growth</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Identify and apply safe working practices</td>
<td></td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td><strong>that contributes to ongoing improvement and expansion in employee and company operations and outcomes</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Identify skill gaps and plan personal development</td>
<td></td>
</tr>
<tr>
<td><strong>Technology</strong></td>
<td><strong>that contributes to the effective carrying out of tasks</strong></td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>A broad competency: Use technology in a range of work activities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Or A range of electives specific to technology that may include (indicative not exhaustive):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use a range of ICT applications to support and enhance work</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use a range of tools and resources to complete activities</td>
<td></td>
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<tr>
<td></td>
<td>• Create content using multimedia</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use programming skills to solve a problem, and to develop and refine a solution</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Establish the configuration and uses for different electronic switching networks</td>
<td></td>
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<tr>
<td></td>
<td>• Create a communication network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Create a computer network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Design and layout digital assets according to agreed quality and production requirements</td>
<td></td>
</tr>
</tbody>
</table>
## Certificate 2 in Information, Media and Technology

<table>
<thead>
<tr>
<th>Employability Skill</th>
<th>Competencies</th>
<th>Technological Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Communication</strong> that contributes to productive and harmonious relations across employees and customers</td>
<td>Communicate and collaborate with others</td>
<td>Personal</td>
</tr>
<tr>
<td></td>
<td>Access and evaluate the reliability and credibility of different information sources</td>
<td></td>
</tr>
<tr>
<td><strong>Teamwork</strong> that contributes to productive working relationships and outcomes</td>
<td>Work with others to resolve problems while respecting differences</td>
<td></td>
</tr>
<tr>
<td><strong>Problem solving</strong> that contributes to productive outcomes</td>
<td>Interpret and construct models for dealing with real-world processes or problems</td>
<td></td>
</tr>
<tr>
<td><strong>Initiative and enterprise</strong> that contribute to innovative outcomes</td>
<td>Develop creative and innovative solutions to a challenge and need</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Develop creative and original responses to problems and technical requirements</td>
<td></td>
</tr>
<tr>
<td><strong>Planning and organising</strong> that contribute to long and short-term strategic planning</td>
<td>Plan, organise and evaluate work to agreed quality standards</td>
<td></td>
</tr>
<tr>
<td><strong>Self-management</strong> that contributes to employee satisfaction and growth</td>
<td>Follow OHS and environmental policy and procedures</td>
<td></td>
</tr>
<tr>
<td><strong>Learning</strong> that contributes to ongoing improvement and expansion in employee and company operations and outcomes</td>
<td>Identify current and future skill needs and plan personal development</td>
<td></td>
</tr>
<tr>
<td><strong>Technology</strong> that contributes to the effective carrying out of tasks</td>
<td>A broad competency: Use technology to complete a project</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Or A range of electives specific to technology that may include (indicative not exhaustive):</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Use a range of software to enhance work outcomes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Operate integrated information technologies to complete work outcomes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Capture, manipulate and combine media assets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Design and produce print-ready graphics</td>
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<tr>
<td></td>
<td>• Design and produce a 2D animation</td>
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<tr>
<td></td>
<td>• Write content for a range of media</td>
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<tr>
<td></td>
<td>• Prepare and produce digital assets using specialist applications</td>
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<td></td>
<td>• Write software</td>
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<td></td>
<td>• Design and test a database</td>
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<tr>
<td></td>
<td>• Install, maintain and modify communication cabling</td>
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<tr>
<td></td>
<td>• Plan and set up a small wireless network</td>
<td></td>
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<tr>
<td></td>
<td>• Develop and test a prototype network solution</td>
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</tbody>
</table>
Figure 29 - Suggested range of options for the improvement of existing ICT-related Training Packages

Option 1: Improve Existing
- Certificate III
- Certificate II

Option 2: Add a cross-industry qualification suite
- Electives leading to Screen and Media
- Electives leading to Telecommunications
- Electives leading to Information Technology
- Electives leading to Printing & graphic arts

Certificate II in Information, Media and Technology
Certificate I in Information, Media and Technology

Competencies Tied to Employability Skills
- Applied skills
- Social Knowledge
- Personal knowledge and understanding

Certificate I, II & III in Information, Media and Technology
10.2.4 Pedagogical Model

A pedagogically sound model needs to complement any briefing paper or explanation of how qualifications in Option 2 or Option 3 will be delivered. The following Victorian Certificate of Applied Learning approach but, in recognition of the research and findings in this report, separate context and application. This aligns with the findings on the three dimensions to technological knowledge.

**Figure 30 - Information, Media and Technology Applied Learning Model**

The efficacy of this Applied Learning Model is highlighted when we examine how it can leverage the three aspects reported in the MacArthur Digital Youth Report as to how digital natives are currently engaging with the use of digital media and technology (Ito, et. al., 2008).

**Figure 31 - Applied learning model based on how young people engage with technology**
The aim would be to use different learning activities to reinforce how young people typically use technology. Each dimension has its own merits but the construction of theory and skills would result from both hanging out (collaboration and interaction) and messing about (application and self-discovery through use) to reinforce deeper and broader of applied knowledge and skills.

10.2.5 National Teaching and Learning Materials and Resources

The success of any effort to construct a more flexible approach to ICT-related Training Package implementation will require a systematic approach to the provision of Professional Development for teachers delivering VET in schools. Their requirements are not being met by the traditional resources supporting Training Packages. Teachers need lesson plans, less complex and more relevant assessment plans, tools, samples and templates.

Any approach to professional development should engage with those possessing expertise in delivery of Training Package-based ICT courses, particularly in the VET sector (e.g. TAFE). This relationship should extend to a national professional development network that spans every State and Territory at all levels of education and public, community or private sector providers.

The provision of support materials, resources and tools can leverage existing national strategies in the VET-sector that have sought to facilitate the storage, sharing, discovery and accessing of Resource and Learning Objects (RLOs).

10.2.6 Web 2.0 tools and applications supporting technical teacher’s professional development and community

Professional development or support for technical teachers in ICT-related vocational subjects is essential to the success of not only the design of the applied learning experience, but also to the engagement of students. The teacher’s professional development should form part of a national strategy. Any solution should optimise not only the networking and collaboration between teachers, it should use the very tools they will be required to use when teaching and constructing meaningful learning contexts for their students.

10.2.7 National Reporting and Measures

The capacity of our young people to use information, media and technology is a basis for their own and Australia’s success.

Ultimately the ability to engage young people in ICT is a critical aspect of how they will learn, work and participate in any future society (21st Century Skills, 2008). The imperative to act has to be driven by not only the benefits to young people but also the resulting improvements to the national education and training system and Australia’s global competitiveness.

The findings listed and suggested needs identified in this investigative report do not fall into a policy vacuum. The Ministerial Council for Education, Employment, Training and Youth Affairs (MCEETYA) has an ICT in Schools taskforce examining issues related to the use of information communication technologies. A strong research focus has also accompanied the taskforce’s work (MYCEETYA, 2003b).
A national strategy to address ICT education and improvements is required. Collaboration between the Australian, State and Territory governments needs a strategic and policy context. This is particularly important given the feedback received from teachers that give anecdotal indications that major policy initiatives such as laptop in schools and broadband infrastructure projects are reshaping resource commitments at a school level and dangerously shifting Department of Education-level decision back to infrastructure and the technology used and away from what is currently working for teachers, students and their major stakeholders such as parents and employers.

Benchmarks that are tied to robust reporting mechanisms will be required to set priorities and measure progress.

10.2.8 Positioning a National Strategy, globally

Australia’s situation is reflected in a global context. This is confirmed in the table below where two of the top ten policy priorities for the OECD involve promoting IT education, and industry-based and on-the-job learning.

Table 12 – OECD identified top 10 ICT policy priorities, 2008

| 1 | Government online, government as model users |
| 2 | Broadband |
| 3 | ICT R&D programmes |
| 4 | Promoting IT education |
| 5 | Technology diffusion to businesses |
| 6 | Technology diffusion to individuals and households |
| 7 | Industry-based and on-the-job training |
| 8 | General digital content development |
| 9 | Public sector information and content |
| 10 | ICT innovation support |


Even a cursory examination of other countries shows Australia can orient its own effort by reviewing how national strategies to seek an integrated approach to address ICT education while promoting economic activity based on digital and media technologies. Review of these strategies provides insights into factors and issues outside the scope of this investigative research report, for instance ‘next generation’ pedagogies, e-learning, and strategies to assist those who are ‘digitally excluded’ through the emerging digital divide (Ainsley & Searle, 2007:4 & 6).

National strategies on digital learning and building digital industry have occurred in Canada, Europe, New Zealand, the United Kingdom, and the United States (White, 2008). While Gerry White reported on how research on digital learning in Australia can link to global effort (White, 2008), this investigative research report would recommend the following overseas sites relating to national strategies and globally important collaborations or research into the digital futures and the impact on young people.

- The UK strategy ‘Technology strategy for further education, skills and regeneration’ being led by BECA the government agency leading the national drive to ensure the effective and innovative use of technology throughout learning; [http://www.becta.org.uk](http://www.becta.org.uk).

• See Singapore Government’s efforts to develop an integrated roadmap to align national technological direction and education effort with worldwide ICT developments; http://www.ida.gov.sg/Technology/20060417212727.aspx.

• University of Southern California (USC) Digital Future Project is conducting a long-term longitudinal study on the impact over time of computers, the Internet and related technologies on families and society; http://www.digitalcenter.org.

• Pew Internet and American Life Project is an initiative of the Pew Research Center, a nonprofit “fact tank” that provides information on the issues, attitudes and trends shaping America and the world; http://www.pewinternet.org.

• MacArthur Foundation research into Living and Learning with New Media: Summary of Findings from the Digital Youth Project; http://www.macfound.org/site/c.lkLXJ8MQKrH/b.4293515/apps/s/content.asp?ct=6355113

• European Schoolnet is an international partnership of 31 European Ministries of Education developing learning for schools, teachers and pupils across Europe; www.eun.org.

• Beyond Current Horizons project aims to ensure that the UK education system has identified and prepared for a wide range of potential social, technological and cultural futures; http://www.beyonddurrenthorizons.org.uk/programme/research-challenges/

• Consortium for School Networking a professional association for school district technology leaders in the US; http://www.cosn.org

• STEPS project id the Study of Technology's impact on Primary Schools, Europe's first in-depth analysis of how ICT is making a difference in Europe's primary schools; http://steps-project.wikispaces.com

• Young Foresight is an educational initiative for design and technology within the English and Welsh National Curriculum; http://www.youngforesight.org/default.asp
References


Anderson, J.Q. & Rainie, L. (December 14, 2008). The Future of Internet III. Pew Internet and American Life Project


ABS (5 August 2008e) 3105.0.65.001 - Australian Historical Population Statistics, 2008. Canberra: ABS. Available at
ABS, (September 2008f) 3222.0 - Population Projections, Australia, 2006 to 2101. Canberra: ABS. Available at http://www.abs.gov.au/Ausstats/abs@.nsf/7d12b0f6763c78caca257061001cc588/5a9c0859c5f50c30ca25718c0015182f?OpenDocument

ABS (22 Sept 2008g). 8153.0 - Internet Activity, Australia, June 2008. Canberra: ABS.


Victorian Curriculum and Assessment Authority (July 2006), Applied Learning. Melbourne: VCAA.


sustainable Internet, WITSA-GIIC-Keidanren workshop at the UN Internet Governance Forum, Hyderabad, India, accessed 22 Feb 2009 at: http://www.witsa.org/presentations/Vickery_GreenICT_Initiatives_Workshop52.ppt


