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Review of the Digital Games Development: Game Art, Animation and Programming

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Executive summary

This is the final report of the Innovation and Business Skills Australia (IBSA) commissioned review of the Digital Games Development: Game Art, Animation and Programming. As a snap-shot of this dynamic and enigmatic sector this report will inform any decision on how best to provide businesses and workers in this sector with the skills required to succeed today and in the future.

With estimated gross revenue of over \$2.8 billion in Australia for 2009 the digital games industry is big business. In Australia and across the globe digital games rival going to the movies or buying music and literature. By 2012 it is expected to outstrip these other areas and become the single largest revenue earner in the Australian and global entertainment marketplace. Yet this has occurred in only 35 years since the emergence of the first digital video games for arcade machines and rudimentary home consoles, 30 years since the first digital computer games, 18 years after the internet became a public network, and only 5 years since the advent of massively multi-play online games¹.

In Australia the digital games development and related games art, animation and programming industry activity is small, active and still maturing sector of the Australian economy. In 2009 there are approximately 61 Australian digital games development businesses generating estimated total gross revenue of \$161m. In the last major Australian Bureau of Statistics review in 2007 the sector had 1,431 Full-time Equivalents (FTEs) employed as full time staff, part-time staff and subcontractors.

While growing from 10 businesses in 2005 to 45 in 2007 and to 61 in 2009, less than one third of Australian owned game development businesses had been operating for more than 5 years. This indicates either the prevalence of mergers or the movement of companies out of this sector through attrition or market repositioning.

It is apparent the Australian businesses' total revenue is proportionally a very small component of the overall domestic market total revenue (< 6%). This may be due to Australian businesses' traditional focus on the export marketplace. This makes these businesses subject to global financial fluctuations and difficulties when the Australian dollar enjoys strong parity with the US Dollar. Nevertheless, they are competing in a global market expected to grow exponentially from \$29 to \$31.5b in 2009 to \$54.5b by 2012². It is also significant to note that, while there are distribution costs, there are typically little or no additional production or manufacturing costs associated with online sales to major markets.

Geographically the digital games development sector is predominantly located in Victoria and Queensland. Victoria has 33% of total employment and 35.6% of businesses while Queensland has 48.6% of total employment and 22.2% of businesses (ABS: 2008). Combined, these states generated over 70% of all total income for the sector. The rest of the activity is spread across all other states and territories with only NSW coming close to achieving double digit figures comparable with the two lead states.

Viewed statistically the digital games development industry is dominated by three characteristics:

- 9 out of 10 businesses are small employing less than 10 people (See Figure 3)
- 9 out of 10 employees will be male (ABS, 2008: Table 5; Lowe, 2009:11)
- 9 out of 10 companies suggest the dominant source of income is through export activities (GDAA, 2006:3)

Rapid changes and accelerated convergence of technologies and networks has significantly impacted the commercial viability of some businesses and the overall positioning of the games development sector in the local and global marketplace. Possessing the skills to use new technologies or seize emerging opportunities is a critical component of how games development businesses in Australia survive or improve their competitiveness. For training to be relevant and viable it must cover the hard-edge, technical skills required by the workforce to deploy improved

¹ In Australia commercial sales of Apple II, Commodore 64 and Atari 800 all emerged around 1977 to 1982 and these evolved from game consoles with computing capacity to more fully fledged 'desktop computers' in the form of Apple Macs (1988) and IBM personal computers (1984)

² Range and estimates represents comparative data presented later in Section 3.1.3.

ways to produce games that can keep pace with constantly changing platforms and consumer preferences.

This sector does not fit neatly into any one of the industry divisions IBSA administers. The digital games development sector spans three main industry domains within IBSA's jurisdiction: the cultural (screen and multimedia); information and communication technology; and to a much lesser extent, printing and graphics art.

The review of national qualifications and competencies confirm the games development industry has had a traditional association with the creative industry, primarily through the emphasis on design and digital art. As such the available endorsed qualifications are heavily oriented towards the film, multimedia and arts industries. By way of contrast more recent technology enablement is pushing demand for skills in the areas information technology (IT) development, particularly programming. This further elevates the linkages from this sector to the IT industry.

While sharing of competencies and improved alignment and vocational pathways exist between cultural (screen and multimedia) qualifications and IT the existing workforce has far outstripped the speed with which these changes can make the competencies remain relevant to games development.

Modification of existing qualifications in Training Packages and improving the competencies across cultural and IT can remediate some problems but this is neither an optimal nor a sustainable solution. A dedicated vocational qualification with associated competencies is required.

Summary of Findings

1. The digital games development sector is so dynamic and the competencies such an important nucleus for other substantial, emerging vocational and economic outcomes that IBSA needs to seriously consider developing a standalone qualification with competencies packaged to meet current and emerging needs. There is no technical reason why the resulting qualification(s), competencies and skill sets should not reside in either the CUF07 Training Package and/or the ICA05 Training Package.
 2. While endorsed competencies and qualifications in CUF07 and ICA05 Training Packages do address animation and programming at the lower levels it is apparent to those consulted the design, art and multimedia have been 'repurposed' to digital games when they are more aimed at web design, film and screen. New competencies should be authored to reflect this sector's requirements.
 3. While state and territory accredited national curriculum can provide a substantial foundation to the proposed new qualification and competencies, none can be used 'as is' due to intellectual property issues or because they are too inflexible and inconsistent with national Training Package authoring requirements (current and future).
 4. There exists a 'black box' of game design and game development skills and knowledge that is not well understood. While it is very hard to confirm every businesses' competency requirements the titles for the competencies required across the sector has been identified for later validation.
 5. Flexibility is required to promote an exit point to meet vocational outcomes a game and 3D artists or animator can achieve at Certificate IV level. While programming skills are demanded in the labour market students progressing onto a Diploma that seek to work only in game art and animation should have the elective choice to undertake programming.
 6. Neither educators nor employers seem to want multimedia or 'generalist courses' that do not cover the 'hard edge skills' required to be competitive. Qualifications should be specific to the sector and have:
 - a. a broad foundation with core skills that are technically appropriate to game art, animation, and programming
 - b. elective streams that permit specialisation in game art, animation, or programming
-

- c. management, testing, or soft skills (problem solving, communication, management, etc) should be packaged as the electives that can be imported, not core
 - d. permit skill sets especially at the entry and at the Diploma or higher levels
7. Any qualifications pathways should include:
- a. Consideration as to how foundation skills in content creation can be achieved;
 - b. Certificate IV exit point;
 - c. Diploma as the primary qualification for games development professionals; and
 - d. Advanced Diploma level competences, skills sets and perhaps a qualification covering advanced specialisations in programming and animation/3D art that follow the Diploma level elective specialisation streams.
 - e. Articulation into university courses should be mapped.
8. A conceptual layout can be advanced to show how any qualification needs to address 5 vocational domains (central circle) and related vocational roles (outer ring).

Figure 1: Conceptual layout Digital Games Development Competency Framework³



³ This model is compatible with frameworks drafted for the updated ICA05 and IT10 Training Packages

Recommendations

- Recommendation 1: The current national qualifications in IBSA Training Packages do not satisfy current or future needs of the digital games development, 3D digital art, animation, or game programming needs. To give better coverage it is recommended a **Diploma in Digital Games Development and Interactive Applications** be developed. This may be complimented by a Certificate IV that is either a standalone qualification or an exit point within the Diploma.
- Recommendation 2: New units of competency should be written to enhance coverage of skills and knowledge required in the areas of digital content creation, games development, 3D and digital art, animation, and virtualisation.
- Recommendation 3: Career pathways should be promoted that are broader than the games development sector by ensuring qualifications provide core competencies and elective streams allowing specialisation in vocational pathways that already exist or are emerging.
- Recommendation 4: Entry level qualifications in CUF07 and ICA05 should be enhanced to better promote not just the foundation or essential skills in new media and digital content creation, but to promote articulation of graduates from these qualifications into further learning and work relating to the digital games development and 3D and interactive media vocational outcomes.
- Recommendation 5: The skill sets identified as relating to games development, game art, animation and programming should be embed within the proposed qualifications and endorsed as part of a national Training Package.

Points to Note

Research and findings have been shaped by a number of issues noted throughout the report. Confirming and profiling the qualifications and competencies required by this sector has been a challenge. Some enduring issues to note that will affect later qualification design and implementation:

1. As technology converges and changes occur so will the boundaries of this sector shift to span many industries planners should not expect a consistent or homogeneous sense of vocational outcomes to emerge that neatly fit any formal ABS classification of occupations.
 2. Many businesses have a range of specialisations and competitive differentiation that are closely protected
 3. Many providers have developed and accredited customised curriculum that results in learning approaches that provide them with competitive advantage they are reluctant to share
 4. While the digital games development sector is dominated by small businesses that want generalists this does not mean the dominant vocational roles such as animators, game artists and programmers necessarily have to have a single, merged set of skills. Often specialisation occurs after graduates are employed.
 5. University degrees hold greater 'professional' status but industry preference (employee and employer) seems to be that applied competence and immediate contribution to a company's productivity has strong appeal. Advanced standing (credit transfer) or continued professional development pathways therefore need to be developed by school, vocational and higher education providers to encourage existing employees or students that move between education sectors.
 6. At the higher levels of work highly contextualised, applied skill sets able to be delivered in intensive programmes are preferable to full qualifications.
 7. No research is available to show the skill needs of multinational games development companies that have located in Australia (eg. Interzone Entertainment in Western Australia, Sega Creative Assembly in Queensland), or developed relationships with Australian companies (eg. EA Games).
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1. Introduction

Digital content can provide new impetus for the digital economy, encouraging innovation, raising the levels of skills, triggering dynamic developments and innovations in existing industries and creating new markets

(Senator Conroy, July 2009, *Australia's Digital Economy: Future Directions*)

1.1 Purpose

This is the final validated report and recommendations covering the future development of qualifications, skill sets and units of competency for digital games development and related areas of game art, animation and programming.

The digital games development sector is a highly interdisciplinary area with many different types of activities. As a result there exists a myriad ways employers describe job roles the resulting skills and competencies they need. Some job roles have easy to identify names, such as 'Game designer' or 'Game programming'. But more typically new jobs are emerging with titles that represent the eclectic nature of the skill mix and 'mash-up' of skills across a range of industries; for instance 'Multimedia programmer', or '3D texture artist'. To compound this difficulty the Australian industry is dominated by small businesses, with highly niched, specialist interests and endeavours.

It is beyond the scope and capacity of this research report to catalogue every possible job role and its associated skills. While there is no expectation a national qualification can cover all the units of competency the Australia digital games development sector may want, it should cover the provide a qualifications structure with core and elective competencies from which a Registered Training Organisation (RTO) can customise to meet contextual needs while guaranteeing a national standard of competence, recognition, and vocational outcomes.

1.2 Definition

For definition purposes of this report digital games development is a process that involves the multidisciplinary skills across a range of vocational roles deployed in organisations and activities that will generate an interactive program in a playable, real-world format for one or more players. The digital game will be delivered on a range of platforms using the Internet, terrestrial or mobile networks, or media storage devices.

Digital games development spans many sectors with competencies drawn from vocational categories that may include animation (including visual effects, virtual games and 3D products); game art; interactive multimedia (e.g. for computer and online games, websites, CD-ROM's); programming; and digital film and TV content production⁴.

1.3 IBSA current charter and role

The Innovation and Business Skills Australia Industry Skills Council (IBSA <<http://www.ibsa.org.au>>) is one of eleven ISCs funded by the Australian Government through the Department of Education, Employment and Workplace Relations (DEEWR). ISCs are not-for-profit organisations. IBSA has a critical role providing independent skills and training advice to enterprises and government. It also has a role in leading high quality workforce planning and resulting training and development products and services across the following six industry sectors:

Business services

Cultural and related industries

Education

⁴ See International Game Developers Association (2008: 5-6); and AIMIA (2005:5)

Financial services

Information, Communication and Technology (ICT)

Printing and graphic arts.

Given its charter and industry responsibilities IBSA is a major stakeholder in fostering the digital games development sector. Beyond being a stakeholder, IBSA has responsibilities to advise the Australian Government on skill needs in areas critical to growing employment and skills development in this sector. This is especially so given IBSA's role includes managing the development of Training Packages that cover games development activities, including:

CUF07 Screen and Media

ICA05 Information and Communications Technology

ICP05 Printing & Graphic Art

BSB07 Business Services

2. Methodology

2.1 Project Deliverables

The outcome of the project will be a validated report with recommendations on the development of qualifications, skill sets and units of competency in digital games development. The report will:

- identify suitable units in current Training Packages, eg. CUF07, ICA05 and ICP05
- identify suitable available units in State/Territory based courses
- identify gaps and proposes new units for development
- propose new qualifications and/or skill sets for development
- identify units (eg. soft skills) that could be imported into the proposed qualifications, eg. from BSB07 Business Services Training Package
- include a draft outline of the proposed qualifications
- recommend the most suitable Training Package in which to include the qualifications and/or skill sets, ie. CUF07 Screen and Media, or ICA05 Information and Communications Technology

2.2 Methodology

As a research report the methodology heavily emphasised fact finding and qualitative validation of the findings. With the available budget and timing the scope is very much exploratory and setting parameters that can form the basis for later action. Therefore the project was separated into two distinct stages.

Stage 1 – Research and analysis

Identification of units available or suitable for packaging into qualifications for Digital Games Development: Game Art, Animation and Programming. This was achieved through:

- desktop research of units available or suitable for Digital Games Development and where there are gaps
- interview and discussion with key curriculum managers and officials from state and territory skills units or accreditation bodies

Stage 2 – Validation

Validation of key findings through:

- telephone and/or online survey of select industry experts and stakeholders on the relevance and need for existing national accredited competencies and qualifications (Last week November to 2 week December 2009)
 - draft final report with key findings and recommendations (week 2 December 2009)
 - email follow up to key stakeholders (GDAA, those involved in initial feedback, ITAB heads, and wider RTO stakeholders through ACPET) (by 21 January 2010)
 - submission of a final research report (Week 1 February 2010)
-

3. Profile of the Digital Games Development activity in Australia

3.1 Snapshot of the industry

The digital games industry is a relatively small sector of the Australian economy. But it is a rapidly growing activity with the Australian digital games market growing at over 7% per annum, despite the Global Financial Crisis (VERVE, 2009:3; PWC 2009).

3.1.1 Revenue

Based on current growth rates it is estimated the digital game development companies in Australia will have grown from just under \$117 million at the beginning of 2007 to generate over \$161m million revenue in 2009⁵.

Table 1: Australian digital game development business income by format, 2006-2007

Format	%	\$m
Consoles	71.1	83.2
Handhelds	9.6	11.2
PC and Mac	14.6	17.1
Mobile phones & other*	4.7	5.5
Total	100	116.9

(ABS:2008: Table 2) * Data unavailable on publication at more granular level

The data reported by the ABS can be augmented with the latest reports on the relative 'explosion' in the sale of digital games in Australia. The following table provides the estimated revenue of the Australian games industry in 2008. It is unknown to what extent the growth in sales has resulted in improvements to the Australian digital games development companies' revenue. Although international companies seem to have done well. It has been reported that Sony Computer Entertainment Australia and Nintendo's Australian revenues have been growing from 20 to 50 percent respectively from 2007 to 2009 (Bryant, 2009)⁶.

Table 2: digital games Gross Annual Revenue in Australian by format, 2008

Format	%	\$m
Consoles Video Games (Xbox, Playstation, Wii, Nintendo DS, etc.)	46.5	1,308
Computer games	53.3	1,500
Mobile phones & other*	0.2	5.5
Total	100	2,813.5

(Australian Games industry 2009; PWC, 2009; Multimedia Victoria, 2009:2)

The table below shows that businesses providing digital game development services were located predominantly in Queensland and Victoria.

Table 3: Key characteristics of digital games development sector by state and territory 2007

	QLD		VIC		NSW*		TOTAL
Employment (People)	48.6%	695	33%	472	7.2%	103	1,431
Total income (AUD\$)	40.4%	\$55.4m	33.2%	\$45.5m	8.5%	\$11.6m	136.9
Number of businesses	22.2%	10	35.6%	16	17.8%	8	45

(ABS:2008: Findings: page 1; NSW DSD, 2009:10;)

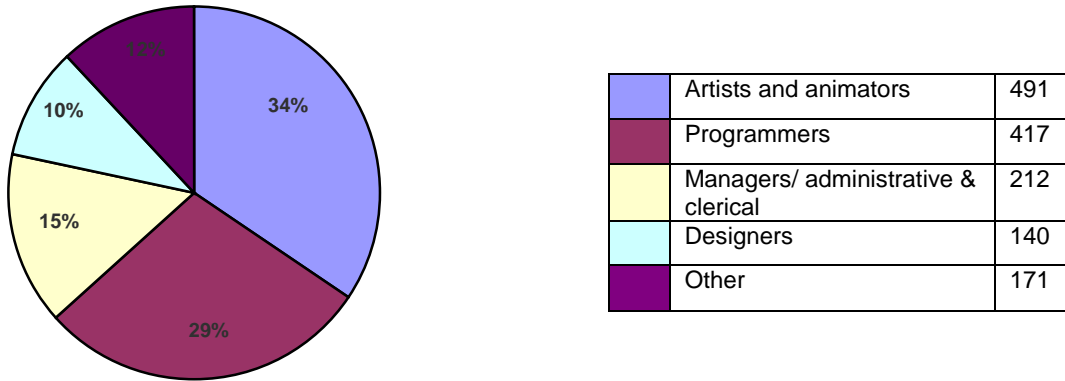
⁵ This estimate is based on unsubstantiated evidence the Australian businesses grew at a conservative 9% from the 2007 revenue based on the lowest growth rate for the Australian digital games sector and not the higher rates of growth for the global digital games marketplace.

⁶ This growth forecast is reinforced by the late 2008 and early 2009 press releases from the Interactive Games and Entertainment Association, see <http://www.gamesindustry.biz/articles/game-sector-sees-8-percent-growth-in-australia-throughout-2009>.

3.1.2 Employment

At end June 2007, there were 1,431 people employed (full time equivalents) by digital game development businesses. Over 89% were male. The graph below shows the breakdown of employment by the main activities (ABS, 2008: Table 5).

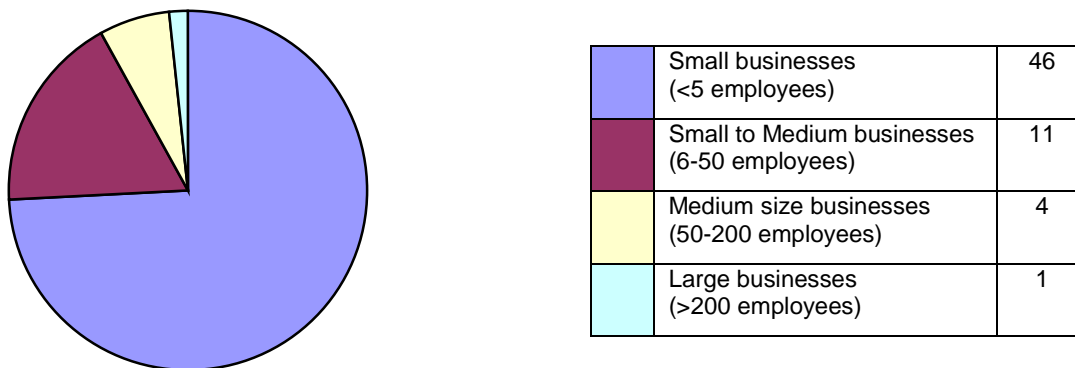
Figure 2: Main activity of persons employed in digital games development sector, 2006-2007



In 2009 it is estimated there are approximately 62 digital game development and directly related interactive media companies in Australia (See Attachment 1 for many of these companies). Queensland has grown from 10 to 18 companies, Victoria from 16 to 22, NSW from 8 to 12 and another 10 being reported in the remaining states and territories⁷. These numbers do not suggest a linear growth of existing players. A few notable closures have occurred in the industry and the listing of companies in 2009 would suggest only a third have been trading for more than 5 years.

The digital games development businesses are predominantly small businesses.

Figure 3: Size of companies in the digital games development and interactive media sector, est. 2009



One of the significant trends since 2006-2007 study of games development and programming industry in Australia has been the emergence of companies in states and territories beyond Victoria and Queensland. NSW government has made a conscious effort to plan development of this industry (NSW DSD, 2009) and now has over 10 businesses. A number of companies have emerged or extended their market to cover games development in Western Australia, ACT, Tasmania (TasIT, 2008) and South Australia.

⁷ Estimates based on Yellow Page listing with active, authenticated web sites; web listing and figures provided on game development companies by state from Multimedia Victoria, Games Queensland, and NSW Department of State Development. See Attachment 1.

Table 4: Australian digital games development sector employees and income, 2006-2007

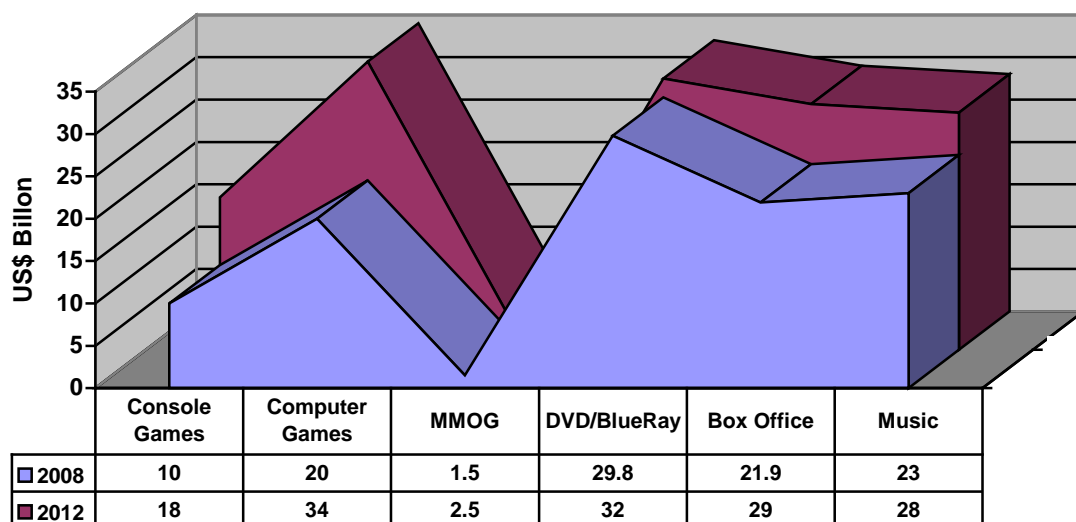
	Employees		Mean Income	
	Number	Percentage %	AUD\$ Millions	Variance from Australian average (%)
NSW	103	7	6	17
VIC	472	33	21.2	-10
QLD	695	49	35.1	2
Other	161	11	8.8	10
Australia	1431	100	71.1	0

(ABS: 2007)

3.1.3 International digital games market

In 2008 the global retail sales of games for the first time outstripped box office (movies excluding video sales and rental) and by 2012 is expected to be the largest generator of entertainment revenue. The estimated global sales are listed below and show that by 2012 digital games sales will generate revenue of some US\$54.5 billion.

Figure 4: Gaming comparative worldwide retail sales 2008 and forecasted 2012



(Source: composited from PWC, 2009; Cavalli 2008; Nolan, 2008; & Crossley, 2009)

Victoria and Queensland were able to capture and maintain almost three quarters of the Australian gaming software development sector (see Section 14.3 regarding initiatives in these states (NSW, DSD, 2009:90 and PWC 2009: 154).

3.2 Limitations and challenges

3.2.1 Defining the industry and employment

The main difficulty in studying the digital games development sector in Australia is its overall lack of definition and recognition in national data collections; especially the Australian Bureau of Statistics (ABS). In spite of its known economic importance and growth reported in numerous state and territory-level⁸ reports, the sector is still not obvious on the national labour market 'radar'.

⁸ Especially in Victoria by Multimedia Victoria and in Queensland by Queensland Games and Information Industries Bureau, Department of Employment, Economic Development and Innovation.

This means neither economic trends nor employment data is tracked. Nor is the national industry classification (ANZSIC) or occupational classifications and codes (ANZSCO) sufficiently distinct to permit accurate reporting. This makes forecasting a difficult undertaking for the ABS, IBSA, other government bodies, professional associations or stakeholders.

Convergence of technologies, networks and content has further blurred the way we define the digital games development industry as part of the wider cultural or ICT industries in Australia. Even the picture formed by the Australian Government of the national Creative Industries has led to a focus on activities that do not lead to the easy isolation of a digital games development industry. For instance the major activities in the industry have been sorted into:

- the production and marketing of film and television programs in the form of digital and interactive TV
- online games
- re-usable electronic education content
- the marketing and supply of the holdings of museums, galleries and libraries in digital form
- Internet-based publishing of music, text, films and games
- the development and marketing of software, games, and online services that create digital media and visual effects, or help to manage and publish them (DCITA, 2006: 8)

While the above may confuse what constitutes the 'digital games' sector, what activities are actually performed in the digital games development sector is further muddled by the desire to separate out 'online and interactive games' from broadband, educational, and Mobile 3G content creation (Higgs and Kennedy, 2004: 153). In a sector where convergence dominates trends the importance of not artificially distinguishing digital content by platform or network is well understood by both employers and training providers.

3.2.2 Defining companies and revenue profile

Unlike many other sectors there is no publically available register of some of Australia's largest games development and interactive digital media firms. Nor is it possible to access revenue for these companies by region; by export or domestic sales; or by product and service type⁹.

3.3 Emerging trends and industry outlook

Digital games development is an area of activity with all the characteristics of a sector growing to serve the digital economy. Even if we could classify the sector as part of the entertainment industry its impact is not limited to this industry. Games products and services are deployed in all industries. Competencies required to develop games are relevant to many occupations in all industries and at all levels of employment.

As digital technologies create opportunities for sectors such as games development, they also cause disruptions to traditional jobs and career pathways.

The recent review of the ICA IT Training Package and national vocational pathways and qualifications (IBSA, 2009a) uncovered the erosion of traditional programming 'vertical' career pathways in the IT development industry. But there were emerging new job pathways where the games development industry was a critical stepping stone for emerging activities to source employees. This new 'horizontal' career pathway saw programmers and games developers harnessing trends and moving into eight related or subsequent vocational pathways:

⁹ It is noted that GDAA 2006 industry report confirmed the 10 games development companies in Australia were 80% export oriented with most being over 90% export oriented (2006:3).

Table 5: Emerging vocational activities directly relating to game development, game art, animation and programming skills

Vocational activity	Definition	Industry deployment & employment
1. Simulations	This includes walk through experiences, overviews and fly-throughs (architecture); or the modelling and simulation of extra-terrestrial environments or anatomy; training and strategic planning simulations and scenarios.	defence; mining; government; health; construction (building, architecture and design); space research; manufacturing; retail sales (motor vehicles, real estate, IT, etc.), environmental planning, museums, and tourism
2. Special effects	Produce real life action using digital models and effects. This is often used to reduce risk, enhance visual effects or emotional engagement, it can lower the costs of production, or make the impossible possible.	film, TV and entertainment
3. 3D and virtualisation	Evolving from digital domain of computer aided design (CAD) this area covers 3D computer modelling, computer-generated animation, geo-spatial and 3D maps and cross-sections, 3D interactivity, 3D laser scanning, prototyping, stereo projection technologies, motion capture for characters and digital to direct manufacture/production	mining; urban design, manufacturing; product and industrial design; advertising and marketing industry
4. 3D digital art and rendering	Unique creations where individual's can configure avatars, environments and other digital assets to reflect unique, personal contexts	advertising, e-business, education, health, printing and graphic art, business, packaging, and manufacturing
5. Interactive multimedia	Creating interactive digital experiences that require human input to affect outcomes	education, health, mining, entertainment, education, and publishing
6. Mobile games and applications	The growing demand for applications and games that are enabled by next generation phones (iPhone), devices (handhelds), and telecommunications networks.	telecommunications, retail and entertainment
7. Mental Fitness and Business Tools	The increased demand for tools to improve intelligence or test specialist knowledge	telecommunications, entertainment, business, fitness – physical and mental, education
8. Virtual and online games	This is effectively the development of the virtual applications, tools and environments. Paradoxically, this area draws on and is responsible for growing many of the other categories above.	entertainment, film and TV, tourism, and real estate

The expansion of digital TV and high speed broadband (> 50 mbps) enables household and business users to access interactive digital content. This opportunity is leveraged by games developers and off-shoot interactive media companies in Australia to provide value add products. While this is likely to include innovations that have yet to be fully appreciated a few of the main opportunities do include:

- Development of mobile applications and content
- Interactive television
- IPTV games

- Multiplayer games, especially massive multi-play and role play online games.
- Games able to be accessed on mobile phones using improved broadband networks
- Interactive virtual games played on HDD TV
- Geo-positioning games and multimedia content (content tied to a physical, global location)
- Cross-platform entertainment and 'smarter' games able to be played across multiple devices (game consuls, mobiles, computers, TV, etc.)
- Interactive and high speed broadband enabled social networking and collaborative content creation
- Portable platforms beyond digital games on computers (eg. wearable computers and digital entertainment devices)

Some of the key trends that also represent possible threats include:

- The increased competition for the consumers' spend on digital games and entertainment, or the so-called 'battle for the digital living room'.
- Shift, especially in the female demographic, from games to video enables social networking, and mental intelligence, style and health applications.
- The growth of digital broadband, such as with the National Broadband Network (NBN), and availability of alternative entertainments in digital models such as HDD Digital TV, video on demand, music and such like.
- massively multiplayer online games (MMOGs) and Virtual Worlds that use innovative business and subscriber models.

The growing impact of MMOG is especially undeniable. According to research from Strategy Analytics, World of Warcraft (WoW) alone has 11.5 million monthly subscribers in January 2009¹⁰. If it was a country it would be the 85th most populated and while the WoW company generates \$200m in 2008 from subscribers the actual revenue generated from transactions and sales associated with the game is estimated to be over \$500m (sale of characters, gold, cards, etc).

The strongest trend in terms of new games development companies seems to be the growth of businesses, especially one to three person operations, in the mobile games development (Lowe, 2009). Apparently many graduates and expert games programmers unable to secure contract or full time work are developing applications and selling them on the web. The primary platform being iPhones, but other work is being done for mobiles with Windows operating systems. The later being mainly for applications and m-learning, not games. This 'build and churn' work characteristically has low overheads, rapid applications development, self-published, low sell price and use of the web as a channel to market (eg. sell via eBay).¹¹

¹⁰ See <http://www.strategyanalytics.com/default.aspx?mod=PressReleaseViewer&a0=3569>

¹¹ This issue was confirmed by a number of interviews, especially with Queensland, WA and Tasmanian contacts.

4. Occupational coverage

4.1 Industry Classification

The digital games development, game art, animation and programming is not a classified industry. Its activities can be classified as a 'sector' of economic activity and employment that span many industries. Using the Australian and New Zealand Standard Industry Classification (ANZSIC-2006) the two main industry classifications that are relevant include: R. Arts and Recreation Services; J. Information Media and Telecommunications. As an Industry Skills Council these industry classifications respectively fall under two IBSA industry jurisdictions; cultural and information and communication technology (ICT).

4.2 Occupations

Just as the industry coverage does not fall into any one classification, so the occupations span many formal classifications in the Australian and New Zealand Standard Classification of Occupations (ANZSCO 2006). The following table gives us the best insight into the total employment by occupations relevant to the games development and related activities. Based on the 2006 Census the data can be used to provide insight into where employment numbers suggest a wider career pathway for graduates with appropriate vocational qualifications and technical skills. In IBSA terms digital games development activities are a small, niched sector within the wider cultural and ICT industries.

Table 6: Games development, graphic art, animation and programming Industry employment by relevant occupation (ANZSCO) and age, 2006

Cultural Industry relevant occupations (ANZSCO)	Age and total employment				
	15-19 years	20-39 years	40-54 years	+55 years	Total
212000 Media Professionals, nfd	15	716	538	258	1527
212100 Artistic Directors, and Media Producers and Presenters, nfd	4	59	52	40	155
212111 Artistic Director	0	77	80	35	192
212112 Media Producer (excluding Video)	18	3,171	1880	526	5,595
212317 Technical Director	4	182	148	57	391
212318 Video Producer	6	322	267	127	722
232411 Graphic Designer	350	16,008	4,793	1,187	22,338
232412 Illustrator	16	916	407	162	1501
399516 Sound Technician	146	2,265	1,071	260	3,742
599912 Production Assistant (Film, Television, Radio or Stage)	42	827	162	24	1,055
135199 ICT Managers, nec	8	345	311	80	744
225212 ICT Business Development Manager	3	916	556	87	1,562
232400 Graphic and Web Designers, and Illustrators, nfd	11	238	71	16	336
232413 Multimedia Designer	28	1,215	365	102	1,710
232414 Web Designer	124	2,603	621	138	3,486
260000 ICT Professionals, nfd	240	10,915	6,758	1,421	19,334
261200 Multimedia Specialists and Web Developers, nfd	0	97	35	4	136
261211 Multimedia Specialist	11	514	88	14	627
261212 Web Developer	79	3,640	658	104	4,481
261300 Software and Applications Programmers, nfd	7	772	478	66	1,323
261311 Analyst Programmer	10	4,813	3,105	518	8,446
261312 Developer Programmer	128	15,137	7,425	1,438	24,128
261313 Software Engineer	32	11,210	4,649	686	16,577
261399 Software and Applications Programmers, nec	22	1,563	720	83	2,388
263200 ICT Support and Test Engineers, nfd	6	255	162	33	456
263211 ICT Quality Assurance Engineer	4	299	201	72	576
263213 ICT Systems Test Engineer	8	722	401	80	1,211

Cultural Industry relevant occupations (ANZSCO)	Age and total employment				
	15-19 years	20-39 years	40-54 years	+55 years	Total
313113 Web Administrator	36	1,121	505	121	1,783
313199 ICT Support Technicians, nec	62	914	815	234	2,025
Totals	1420	81,832	37,322	7,973	128,547

(Source Data tables prepared using ABS Census 2006 data, prepared for IBSA, January 2008)

4.2.1 Vocational roles

An examination of national curriculum in Australia and internationally (IDGA, 2008: 32) indicate the following 'critical competency' clusters or vocational outcomes seem:

1. Game Design
2. Digital Media Design
3. Game Art and Animation
4. 3D and Digital Effects
5. Interactive Media
6. Virtual Worlds
7. Multimedia Development
8. Web Development
9. Programming
10. Games Production and Testing
11. Management
 - a. Business
 - b. Legal
 - c. Marketing
 - d. Sales and Service
 - e. Production
 - f. Quality Assurance

4.2.2 Functional divisions

Research and analysis of job roles and the current structure of the digital games development industry suggests a new paradigm for analysing vocational outcomes may be emerging. It centres on five vocational categories:

- A focus on **Games Design** and overall theories—overall design concepts, the creative process, design patterns, risk and reward concepts, meta-stories and narrative, story writing.
- A focus on content spanning **Game Art, Animation and Digital Effects**—the 2D / 3D art, animation, interface and level/environment design.
- A focus on **Development**—with an emphasis on **Game Programming** and the mathematical and other advanced skills relating to game engines (the programs that, for example, operate a 3D MMORPG); **Database development, Software Development** and **Web Development**.
- A focus on **Game Production and Testing**—the finalisation of the product suitable for the hardware technologies and devices that will be used to access the game (eg. networks and capacities, mobile, PC, Mac, consoles, etc.).

- A focus on **Management**—the management of the games development, graphic art, animation and programming business, sales, production, quality, projects and customer support.

4.2.3 Vocational outcomes - Job roles

The qualifications and competencies examined in research shows digital games development covers job roles such as:

- 3D Animator
 - 3D Modeller
 - 3D Texture artist
 - Digital lighting artist
 - 3D character animator
 - 3D Rigger
 - Render wrangler.
 - Level designer
 - Composer
 - Renderer
 - Technical assistant
 - Digital media specialist
 - Game development producer
 - Games developer
 - Interaction media developer
 - Multimedia Authoring Specialist
 - Multimedia designer
 - Multimedia developer
 - Multimedia developer/engineer
 - Game engineer programmer
 - Development programmer
 - Multimedia programmer
 - Multimedia specialist producer
 - PC games programmer
 - Project manager – multimedia
 - PS2 lead programmer
 - Software engineer games
 - Software support engineer
 - Streaming media specialist
 - Mobile applications/ games programmer
 - Developer interactive elements
 - Technical assistant geo-spatial mapping
 - 3D prototype developer
 - Simulations development engineer
-

Even with the array of job titles and impact of emerging technologies and networks (broadband terrestrial, wireless, mobile, etc.) it is possible to depict the games development, digital art, animation and programming vocational roles and competencies in a professional or competency framework. The image below has two levels of classification: the 'Vocational Domain' that groups together the main vocational outcomes and the outer layer with sub-groupings covering 'Specialisation Domains' relating to digital game development roles.

The categories and sub-categories assist sort and classify the relationship not only between different units of competencies but the different focus state-level national qualifications have assumed. This will be confirmed later in Section 5.

Figure 5: Conceptual layout Digital Games Development Competency Framework¹²

4.3 Demand for vocational qualifications

This research project has arisen from digital games development industry demand for improved national competencies and qualifications. However two other areas of significant demands directly relating to training in this sector need to be noted. They include demand for:

1. foundation or 'essential skills' in new media and digital content creation; and
2. programming and 3D rendering skills in emerging activities.

Both the above skill demands have been confirmed in recent national consultation as part of Stage 1 Scoping review of ICA ICT Training Package (IBSA, 2009a) and the IBSA eScan 2010 report (IBSA 2009).

Both demand areas reinforce the nature of the digital games development, game art, animation and programming competencies as relevant not only to emerging vocational pathways, but as enabling social outcomes. The mix of competencies are essential at the lower level to promote participation in the digital economy and at the higher level to promote advanced programming and IT skills required to support emerging markets for games products.

¹² This model is compatible with frameworks drafted for the updated ICA05 and IT10 Training Packages

4.4 Demand for graduates of vocational qualifications

No market information was accessible that could confirm the destination or success of graduates from relevant¹³ nationally endorsed or accredited vocational qualifications. But we know the total number of commencements in the Film, TV, Radio and Multimedia CUF07 Training Package qualifications dropped from 8,400 in 2007 to 7,900 in 2008 (IBSA eScan 2010:36). But there is a lack of finer detail on how many commencements resulted in completions that led to employment in the games development sector. The NCVER approach to annual data collections means participant numbers are inflated because qualifications are generally completed over a number of years and the same student is counted in each calendar year they are enrolled. As a result participant numbers cannot be compared with completions for individual years or longer time periods.

Accepting the inherent weakness in available training data, all data does indicate a sufficient supply of students to meet digital games industry employment demand. We do know over 6,258 of students in relevant CUF qualifications completed training in 2008 (See Table 7 and 8 below). However, Victoria claims that in 2008 and 2009 more than 1,000 students will graduate from programs offered by both RTOs and universities in games design and programming, animation, multimedia and digital art, and design (Multimedia Victoria: 2009:1; Skills Victoria, 2008).

Table 7: **Participation in CUF qualifications relevant to digital games development sector, 2005-2008**

Year	2005	2006	2007	2008	Total
CUF10101 - Certificate I in Media	16	13	5	62	96
CUF20107 - Certificate II in Creative Industries (Media)	0	0	0	21	21
CUF20601 - Certificate II in Multimedia	1,635	1,618	2,117	1,945	7315
CUF30101 - Certificate III in Screen	223	249	188	196	856
CUF30107 - Certificate III in Media	0	0	0	16	16
CUF30601 - Certificate III in Multimedia	1,192	1,584	1,609	1,668	6053
CUF40107 - Certificate IV in Screen and Media	0	0	0	3	3
CUF40207 - Certificate IV in Interactive Digital Media	0	0	0	1	1
CUF40801 - Certificate IV in Multimedia	825	791	694	483	2793
CUF50107 - Diploma of Screen and Media	0	0	0	2	2
CUF50701 - Diploma of Multimedia	636	648	653	532	2469
CUF50207 - Diploma of Interactive Digital Media	0	0	0	0	0
CUF60107 - Advanced Diploma of Screen and Media	0	0	0	0	0
CUF60501 - Advanced Diploma of Multimedia	652	656	660	566	2534
Total	7,184	7,565	7,933	7,503	22159

(Source: NCVER (2009) *VET Provider Collection 2008*)

¹³ See Section 5.1 for listings of national qualifications relevant to digital games development

Table 8: Completions CUF qualifications relevant to digital games development sector, 2005-2008

Year	2005	2006	2007	2008	Total
CUF10101 - Certificate I in Media	18	5	24	42	89
CUF20107 - Certificate II in Creative Industries (Media)	0	0	0	0	0
CUF20601 - Certificate II in Multimedia	444	490	775	368	2,077
CUF30101 - Certificate III in Screen	103	147	128	132	510
CUF30107 - Certificate III in Media	0	0	0	11	11
CUF30601 - Certificate III in Multimedia	259	343	488	361	1,451
CUF40107 - Certificate IV in Screen and Media	0	0	0	0	0
CUF40207 - Certificate IV in Interactive Digital Media	0	0	0	0	0
CUF40801 - Certificate IV in Multimedia	241	190	168	89	688
CUF50107 - Diploma of Screen and Media	0	0	0	0	0
CUF50207 - Diploma of Interactive Digital Media	0	0	0	0	0
CUF50701 - Diploma of Multimedia	227	190	205	169	791
CUF60107 - Advanced Diploma of Screen and Media	0	0	0	0	0
CUF60501 - Advanced Diploma of Multimedia	198	178	171	94	641
Total	1490	1543	1959	1266	6,258

(Source: NCVET (2009) VET Provider Collection, 2008)

While there are over 50 RTOs Australia-wide with the latest CUF07 qualifications¹⁴ relevant to the games development sector, the main RTOs in the games development, animation and programming areas are listed in the following table by the state or territory coverage on their scope of registration.

Table 9: RTOs contributing the largest number of VET graduates in games design and related areas by state and territory 2009

RTO	Web address	Scope of Registration							
		QLD	VIC	NSW	WA	SA	ACT	TAS	NT
Qantm College	http://www.qantmcollege.edu.au	✓	✓	✓	✓	✓	✓	✓	
Southbank Institute of Technology	http://www.southbank.edu.au	✓							
Gold Coast Institute of TAFE registered	http://www.goldcoast.tafe.qld.gov.au	✓							
Academy of Interactive Entertainment (AIE)	http://www.aie.act.edu.au		✓	✓			✓		
Academy of Information technology	http://www.academyit.nsw.edu.au			✓					
Swinburne University of Technology	http://www.swinburne.edu.au		✓						
RMIT University	http://www.rmit.edu.au		✓						
Southern Cross Education Institute Pty Ltd	http://www.scei.com.au		✓						
Box Hill Institute of TAFE	http://www.bhtafe.edu.au		✓						
JMC Academy	http://www.jmccademy.edu.au			✓					

¹⁴ NTIS database search conducted 12 December 2009

RTO	Web address	Scope of Registration								
		QLD	VIC	NSW	WA	SA	ACT	TAS	NT	
Hunter Institute TAFE NSW	http://www.hunter.tafensw.edu.au			✓						
Sydney Institute TAFE NSW	http://www.sit.nsw.edu.au			✓						
North Sydney Institute TAFE NSW	http://www.tafestudy.info			✓						
Central TAFE	http://www.central.wa.edu.au				✓					
Chisholm Institute of TAFE	http://www.chisholm.vic.edu.au				✓					
Canberra Institute of Technology	http://www.cit.act.edu.au						✓			
Tasmanian Polytechnic	http://www.polytechnic.tas.edu.au							✓		
Charles Darwin University	http://www.cdu.edu.au									✓

Acknowledging that not all graduates from the existing array of CUF Training Package courses relating to digital games development, game art, animation and programming (See Table 7 and 8 above) will enter into jobs in this sector, the above RTOs are estimated to graduate over 3,800 students in courses listed in Section 5.1 as relevant to this sector¹⁵. Even excluding university graduates (see list of providers Attachment 3) this is over two and a half times the ABS estimate of the total workforce for all occupations in games development at the beginning of 2007.

4.4.1 Workplace training and assessment

A matter that was raised in consultations and previous reports (VCRITB, 2007; IBSA, December 2009) has been the problems with conducting vocational placements or work-based assessment. As a sector dominated by small businesses placing vocational students in the workplace is always hard. However, employers confirmed the specialised nature of the work raised the risk for them if the student was not work ready or able to competently use certain technologies and applications.

Feedback suggested a prevailing need for training facilities replicating game development studios or dedicated training and assessment venues where 'studio-like' conditions could be achieved. In this manner students could gain more applied skills before they entered the workplace. The parallel benefit was also felt to be the ability of the student to be able to confidently deploy their skills in a business-like context. As much of the initial demand for recruits came from project or contract work employers and industry experts agreed that vocational trainees with real 'studio' experience were far more likely to be ready to work or to set up their own contracting businesses.

4.4.2 Skill needs

The digital games development sector is not a large employer. Nor is the sector stable in terms of regional employment. Pressures from changes to global entertainment industry and especially the more recent strong Australian dollar have caused attrition in many small and medium sized export-oriented companies. This has meant the prevailing profile of the industry is as small businesses or as micro-businesses with one or two employees. Despite the number of graduates each year from RTOs and universities far out stripping total employment in the sector skill shortages still remain. Some skill needs or shortages that were reported include:

- Games software and applications programmer (especially C++)
- Interactive media specialist (this specifically included geo-spatial mapping in mining, 3D modelling in manufacturing, simulations in defence and education, and walk-through simulations in real estate and architecture/building)
- Games database developer and administrator
- 3D renderer/technician

¹⁵ Estimates based on data (NCVER 2009a), NCVER (2009) *VET Provider Collection, 2008* and AVETMISS data extract on publicly funded completions by Registered Training Organisation.

- Business Managers

As the table below indicates it is possible to see what high end digital art and programming have become more important as trends emerge. The table maps the eight main trends identified earlier (Table 5) and mapping them against the five main technical competency domains in the vocational roles within the digital games development sector (See Figure 5). While highly subjective it is intended to illustrate an alignment between the trend areas and the relevance of certain domains of vocational competence for typical, current activities.

Table 10: Mapping domains of vocational competency to emerging trends

Vocational roles	Trends							
	Simulations	Special effects	3D & virtualisation	3D digital art & rendering	Interactive multimedia	Mobile games & applications development	Mental Fitness & Business Tools	Virtual & online games
Digital Design	★★★	★★★	★★☆	★★☆	★★★	★★☆	★★★	★★★
Game Design	★★☆	☆☆☆	☆☆☆	★★★	★★☆	★★☆	★★☆	★★★
Game Art	★★☆	★★★	★★☆	★★★	★★☆	★★☆	★★☆	★★★
Animation	★★★	★★☆	☆☆☆	★★★	★★★	★★☆	☆☆☆	★★★
Programming	★★★	★★☆	★★★	★★☆	★★☆	★★★	★★★	★★★

Star rating

☆☆☆ = Low or none ★☆☆ = Moderate ★★★ = High ★★★★★ = Essential

With games development industry continued calls for improved training and better effort to address skill needs the obvious question therefore must be, how relevant are the available national vocational qualifications and competencies to this sector's requirements?

5. Existing National Qualifications and Competencies

5.1 Vocational education and training

The focus for this report is on the national qualifications and competencies. There is only two ways under the Australian Qualifications Framework national qualifications can be derived. They must be

- a. Endorsed as a component of a national Training Package; or
- b. Accredited by an appropriate state and training registration or accreditation body¹⁶.

All national qualifications and competencies are listed on the National Training Information Service (<http://www.ntis.gov.au>) or relevant state and territory curriculum and course catalogue.

5.1.1 Relevant training packages

A consistent theme throughout this review is the pervasive nature of convergence and blurring of the lines of the digital games development sector across occupational and industry boundaries. Any future qualification or packaging of competencies for this industry will be relevant to and could be accommodated in any of the following Training Packages:

CUF07 Screen and Media

ICA05 (soon to be ICA10) Information and Communications Technology

ICP05 Printing & Graphic Art

While it is likely any digital gamed development, game art, animation and programming competencies and skill set could reside in any of the above packages traditionally the industry has had a closer association with CUF than the ICT package. The location of any sector specific qualifications and skill sets should promote flexibility and the importance of continuing to address convergence, in terms of skills, career pathways and technologies. Given the importance of not raising costs for RTOs to extend their scope or current available resources maintenance of games development qualifications and competencies should remain in the CUF07 package. However, changes in ICA05 to ICA10 will undoubtedly promote coverage of relevant competencies.

Ultimate success of any qualification or skill set for this sector will be determined by its relevance to industry, students and to current and future the career pathways.

All qualifications and competencies relevant to games development, game art, animation, and programming are endorsed in the CUF07 Training Package or the ICA05 Training Package. All remaining state and territory accredited courses and competencies were sourced after a review of the NTIS and relevant accreditation or registration bodies or databases. The following sections report firstly the qualifications and later the technical competencies relevant to this sector by either ANZSIC or ANZSCO classification in their accreditation documentation.

5.1.2 Relevant Qualifications

The following are all the qualifications research and consultation confirmed as nationally recognised and accredited qualifications relevant to digital games development within the vocational education and training system.

- CUF10107 Certificate I in Creative Industries ([NTIS](#))
- CUF20107 Certificate II in Creative Industries (Media) ([NTIS](#))
- CUF30107 Certificate III in Media ([NTIS](#))
- CUF40207 Certificate IV in Interactive Digital Media ([NTIS](#))

¹⁶ These are listed at http://www.dest.gov.au/sectors/training_skills/policy_issues_reviews/key_issues/nts/lnk/government.htm#State_and_territory_registering/_course_accrediting_bodies

- CUF40107 Certificate IV in Screen and Media ([NTIS](#)) ([ACT has a modified version to cover 3D/Animation](#))
- CUF50207 Diploma of Interactive Digital Media ([NTIS](#))
- CUF60107 Advanced Diploma of Screen and Media ([NTIS](#)) ([ACT has a modified version to cover 3D/Animation](#))
- ICA30105 Certificate III in Information Technology ([NTIS](#))
- ICA40805 Certificate IV in Information Technology (Multimedia) ([NTIS](#))
- ICA50905 Diploma of Information Technology (Multimedia) ([NTIS](#))
- ICA40505 Certificate IV in Information Technology (Programming) ([NTIS](#))
- 91403NSW Certificate IV in 3D Animation and Digital Effects ([NTIS](#)) ([TAFENSW Listing](#))
- 91277NSW Diploma of 3D Animation and Digital Effects ([NTIS](#)) ([TAFENSW Listing](#))
- 91278NSW Diploma of Game Artistry ([NTIS](#)) ([TAFENSW Listing](#))
- 91399NSW Diploma of Information Technology (Games Development) ([NTIS](#)) ([TAFENSW Listing](#))
- 21543VIC Advanced Diploma of Interactive Applications (Games Art) ([Victorian Training Support](#))
- 21544VIC Advanced Diploma of Interactive Applications ([Victorian Training Support](#))
- 21662VIC Advanced Diploma of Interactive Applications (Virtual World Art) ([NTIS](#)) ([Victorian Training Support](#))
- 21663VIC Advanced Diploma of Interactive Applications (Virtual World Programming) ([NTIS](#)) ([Victorian Training Support](#))
- 51916 Certificate IV in Interactive Games Development ([WA course listing](#)) ([NTIS](#))
- 51767 Diploma of Animation (WA Course Listing) ([NTIS](#))
- 52046 Diploma of Interactive Games Development (WA) ([NTIS](#))
- CUF60101 - Advanced Diploma of Screen (3D Animation and Visual FX) - Alias Maya ([AIE course offering](#))
- 30676QLD Advanced Diploma of Commercial Arts (Electronic Design and Interactive Media) ([Outline](#)) ([NTIS](#))
- 30673QLD Certificate III in Commercial Arts (Graphic Design and Desktop Publishing) ([Outline](#)) ([NTIS](#))
- Certificate II in Information Technology (Basic Game Programming) ([AIE course offering](#))
- Certificate III in Information Technology (Game Programming) ([AIE course offering](#))
- 80252ACT - Diploma of Computer Game Development (Animation)
- 052 Advanced Diploma of Screen (Game Artist) ([SA modified - CUF60101](#))
- Certificate II in Creative Industries (Media) - Basic 3D Animation ([AIE Course Offering](#))
- ACT80841ACT Advanced Diploma of Professional Game Development ([NTIS](#)) ([AIE Art course offering](#) & [AIE Software Development course offering](#))

5.1.3 Relevant Competencies

All competencies have been listed by Australian Qualification Framework level and Qualification outcome (AQF 1-3; AQF 4, AQF 5-6). There were no listings for levels above AQF 6. Only

competencies within a nationally endorsed Training Package would typically be available for all RTOs (code commences with CUF, ICA, ICP or BSB).

All competencies have also been grouped into major vocational Categories.

AQF 1-3 (Certificate I, II and III)

Digital Media

- CUFDIG301A Prepare video assets
- CUFDIG302A Author interactive sequences
- CUFDIG303A Produce and prepare photo images
- CUFDIG304A Create visual design components

Animation

- CUFANM301A Create 2D digital animations
- CUFANM302A Create 3D digital animations
- CUFANM303A Create 3D digital models

Digital Media Design

- CUFWRT301A Write content for a range of media

Multimedia development

- CUFDIG201A Maintain interactive content
- NSWTICA202A Use new media software packages
- ICAD4209B Write content for web pages

Programming

- ICAA4058B Apply skills in object-oriented design

AQF 4 (Certificate IV)

Digital Media Design

- CUFDIG402A Design user interfaces
- CUFDIG401A Author interactive media
- CUFPOS402A Manage media assets
- CUFPPM404A Create storyboards

Multimedia

- CUFDIG403A Create user interfaces
- CUFDIG404A Apply scripting language in authoring

Animation

- CUFANM401A Prepare 3D digital models for production
- CUFANM402A Create digital visual effects
- CUFANM403A Create titles for screen productions

Animation Detailed (NSW)

- NSWTANM401A Use 3D animation interface and toolsets
 - NSWTANM402A Use simple NURBS modelling for 3D animation
 - NSWTANM403A Use simple polygon modelling for 3D animation
 - NSWTANM404A Use simple character rigging in 3D Animation
 - NSWTANM405A Use simple lighting & shading techniques in 3D animation
 - NSWTANM406A Produce digital texturing for the 3D environment
 - NSWTANM407A Use simple 3D animation effects
-

- NSWTANM408A Prepare animation for rendering
- NSWTANM409A Use reference sources to model in 3D animation
- NSWTANM410A Produce 3D animation for broadcast design
- NSWTANM411A Produce a simple 3D animation sequence
- NSWTANM412A Use camera techniques for 3D animation
- NSWTANM414A Understand and apply the principles of animation
- NSWTANM501A Research and source reference for the 3D animation & digital effects
- NSWTANM414A Understand and apply the principles of animation

Digital Media Design (Games)

- 70323 Review a Computer Game
- 70324 Design a Computer Game

3D and Digital Effects

- NSWTANM520A Digital editing for the 3D & digital effects environment

Programming

- ICAA4058B Apply skills in object-oriented design
- ICAB4075B Use a library or pre-existing components
- ICAB4219B Apply introductory object-oriented language skills
- ICAB4224B Apply mathematical techniques for software development
- ICAB4225B Automate processes

Web development

- ICAB4135B Create a simple mark-up language document to specification
- ICAB4137B Produce basic client side script for dynamic web pages
- ICAI4189B Ensure website content meets technical protocols and standards

AQF 5 & 6 (Diploma & Advanced Diploma)

Digital Media Design

- CUFDIG501A Coordinate the testing of interactive media products
- CUFDIG502A Design web environments
- CUFDIG503A Design elearning resources
- CUFDIG504A Design games
- CUFDIG505A Design information architecture
- CUFDIG506A Design interaction
- CUFDIG507A Design digital simulations

Animation

- CUFANM501A Create 3D digital character animation
- CUFANM502A Create 3D digital environments
- CUFANM503A Design animation and digital visual effects

Animation Detailed (NSW)

- NSWTANM501A Research and source reference for the 3D animation & digital effects environment
 - NSWTANM502A Design and create advanced particles, fluids and bodies for 3D and/or digital effects environment
 - NSWTANM503A Create and implement design for organic materials for the 3D & digital effects environment
 - NSWTANM504A Create & implement design for shading for the 3D & digital effects environment
 - NSWTANM505A Design & create advanced lighting for the 3D & digital effects environment
 - NSWTANM506A Develop render pipeline for the 3D & digital effects environment
 - NSWTANM507A Design and create models for the 3D & digital effects environment
-

NSWTANM508A Create and combine 3D components with match-moved footage
NSWTANM509A Create and implement animation rig for 3D character
NSWTANM510A Create and implement anatomy for animation
NSWTANM511A Animate appropriate physical attributes of models & characters for 3D & digital effects environment
NSWTANM512A Use compositing software to create elements for the 3D & digital effects environment
NSWTANM513A Write script using software embedded language for the 3D & digital effects environment
NSWTANM514A Produce an animation and/or digital effects sequence
NSWTANM515A Develop and use textures and UV mapping for the 3D and digital effects environment
NSWTANM516A Participate in a 3D animation, digital effects or game design workplace production
NSWTANM517A Analyse business & marketplace opportunities in 3D, game design and/or digital effects environment
NSWTANM518A Present a portfolio/showreel to promote creative work
NSWTANM519A Employ acting skills to improve movement of characters for the 3D & digital effects environment
NSWTANM521A Produce an interactive product

Digital Media Design (Games)

WA50661FTI03A Identify and apply knowledge of game playing
WA50661FTI08A Produce an interactive game project
WA50661FTI09A Design interactive game play

3D and Digital Effects

VBN323 Develop graphical user interfaces (GUIs) for games
VBN324 Create 3D characters for games
VBN325 Create 3D environments for games
VBN326 Create design documents for games
VBN327 Develop scripts for games
NSWTGAM501A Produce 3D components for interactive games
NSWTGAM502A Design 3D game levels and environments

Virtual Worlds

VBP024 Develop graphical user interfaces (GUIs) for virtual worlds
VBP026: Develop 3D environments for virtual worlds
VBP025: Develop scripts for virtual worlds
BSBEBUS508A Build a virtual community

Programming

ICAA4058B Apply skills in object-oriented design
ICAB4075B Use a library or pre-existing components
ICAB4219B Apply introductory object-oriented language skills
ICAB5226B Apply advanced object-oriented language skills
ICAITB181A Write and document program modules
ICAITB182A Write and compile code, based on requirements
ICAITB137A Produce basic client side script for dynamic web pages
ICAITT082A Manage the testing process
ICAITB170A Build a database
ICAITB068A Build using RAD
ICAITAD042B Determine client business needs
ICPMM581B Manage multimedia production
ICPMM61DA Prepare multimedia for different platforms

5.2 Survey of need and relevance of available national qualifications and competencies

For the purposes of this project a limited, intensive industry consultation phase was undertaken.

The stated project requirement was to liaise with at least 8 industry experts to gather opinions as to the relevance of existing national qualifications and competencies.

The consultation included online survey and telephone contacts. 12 industry experts; 6 industry vocational education and training (VET) experts and a total of 10 other government and industry training board contacts in every state and territory were consulted. 18 people were surveyed, 12 completed the survey. A total of 20 people were contacted by telephone (See Attachment 2 for list of contacts).

The survey and follow up email submissions involved over 70% of those targeted. Extensive input in the process was achieved through the support and involvement of Mike McNabb (Chief Operating Officer, Game Developers Association of Australia) and Justin Brow (60 Sox). Key documents and submissions were also received that permitted the research sections of this report to present an up-to-date view on the games development industry outside the Brisbane Melbourne and Sydney hubs (eg. Richard Lancaster in WA, John Andrius in Tasmania).

The results of the online survey showed the lack of homogeneity in views and opinions as to what courses are most relevant. Overall 12 people fully completed at least the first part of the survey (on Qualifications) and most went on to complete the second optional component on competencies. The key findings included:

1. Feedback suggested relevance and reputation was consistently highest for state and territory accredited or customised qualifications and not for Training Package endorsed qualifications that targeted broad multimedia, screen, TV and film vocational outcomes.
2. Nationally The Academy of Interactive Entertainment rates highest as a respected provider with the most relevant courses
3. Most surveyed had no idea as to the range of national courses and competencies available outside their own region
4. Responses show certain employers and providers feel specialist digital art and game design oriented qualifications and competencies are more relevant, others feel programming and IT development skills are more relevant.
5. Endorsed competencies rated well but the most relevant competencies have a focus on 'hard edge' digital art, animation or programming technical skills and knowledge

Over the phone feedback received regarding the survey and number of times this was recorded:

1. Generally respondents only felt confident commenting on their own course or the qualification used by the provider from which they recruited graduates (x4).
 2. Have never seen the detail in the units of competency (x3).
 3. Did not know there were options outside those offered by private providers (x2).
 4. Employers with over 20 employees recruited beyond their region and two NSW companies took South Australian graduates due to their texturing and modelling skills (x2).
 5. Universities are best positioned to meet higher level programming and animation needs but too slow to develop courses (x3).
 6. Universities only long term providers able to deliver the most relevant and important qualifications come from the higher education sector (x2).
 7. Will not respond as commercial advantage to preserve and protect current games development and animation curriculum and related competencies (x2).
 8. Very hard to attract or retain students at a Diploma level as many completing the course want to focus on game art and design, not programming. Once they encounter maths and programming at any level of rigour they seek an exit point (x2 – relates to comments from NSW and Victoria experts noting the need for a Certificate 4 exit point).
-

9. Traditional focus on game art and linkages to film and TV is retarding development in two ways. Art is dominating over employment in programming, database management and management of technical art production. Secondly, games faculty reside in cultural and recreation when it requires teachers with high level IT skills (x2).
10. It is all too complex and would takes too long to read all the competencies (x1)

Figure 6: The most chose relevant ‘top 5’ qualifications based on ranking and responses

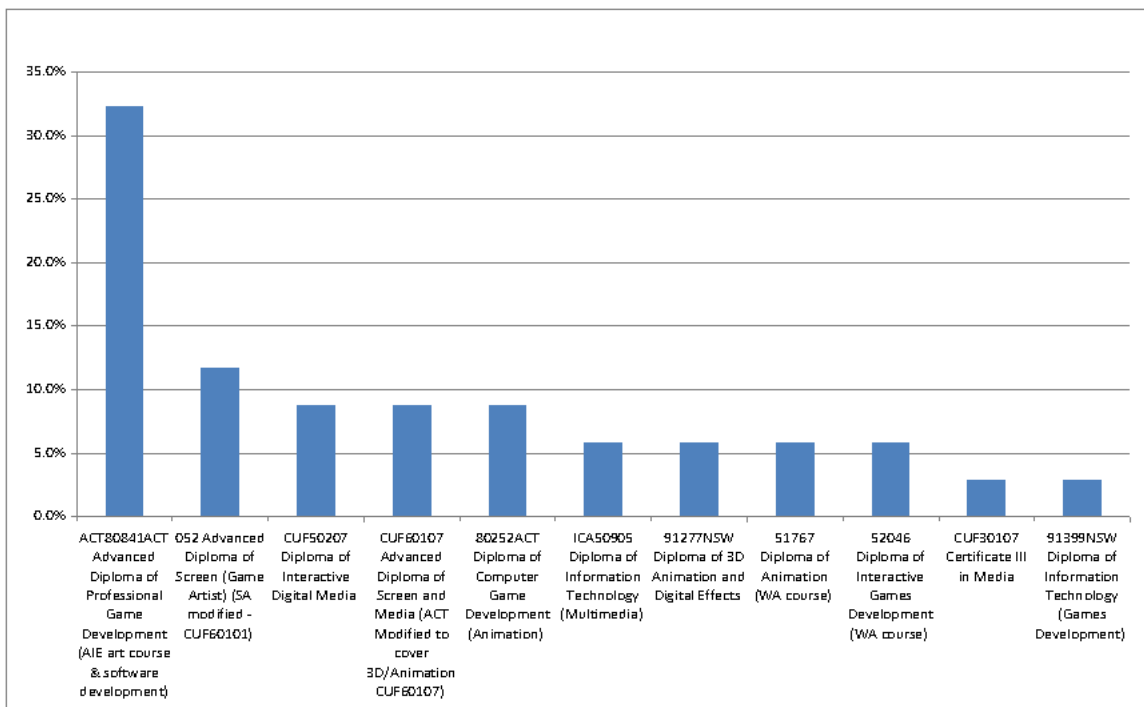
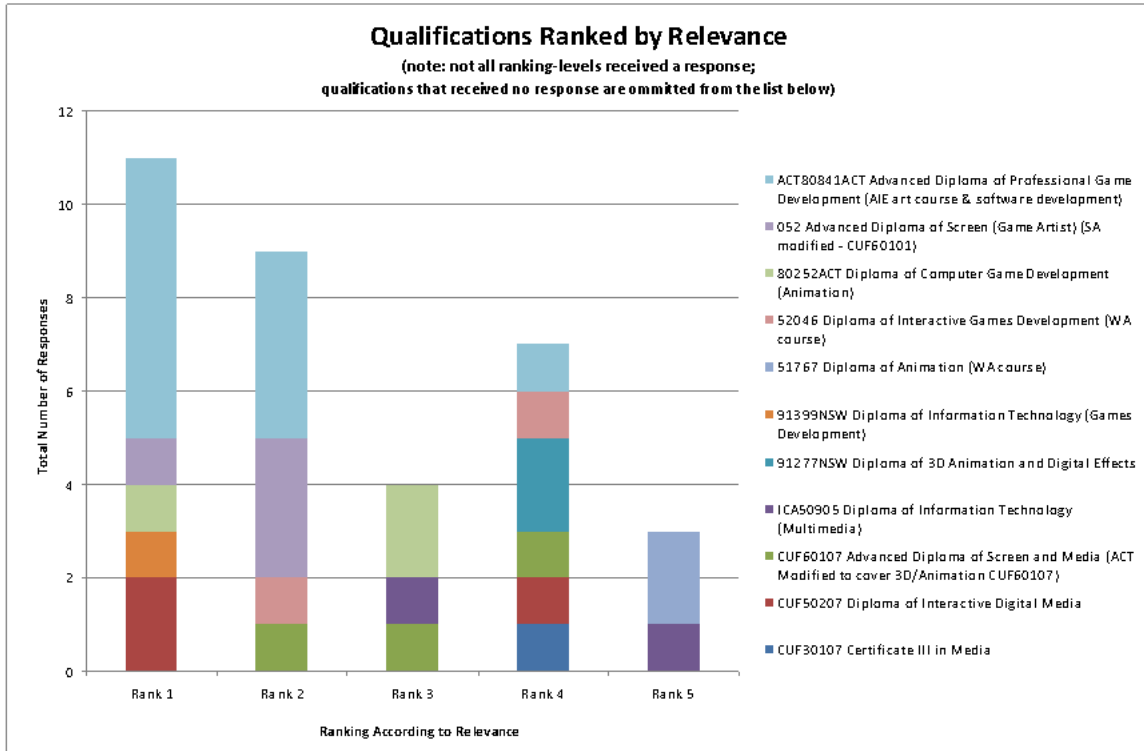


Figure 7: The 'Top 3' qualifications by overall ranking in top 3 for reputation

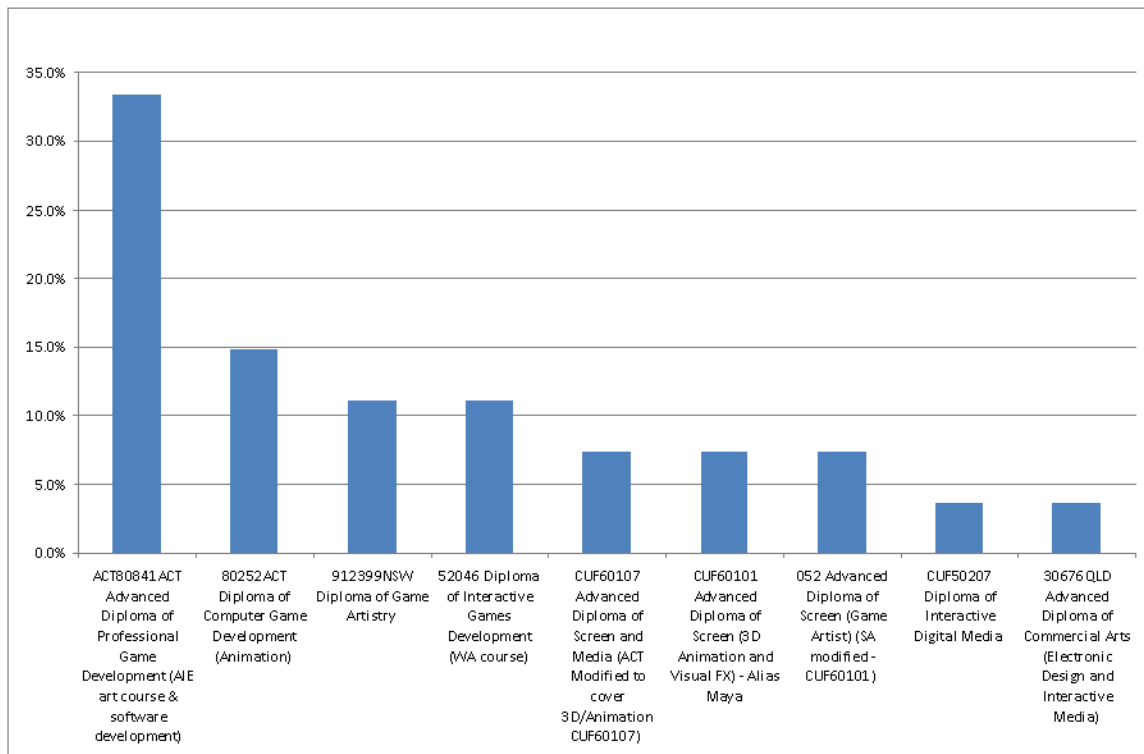
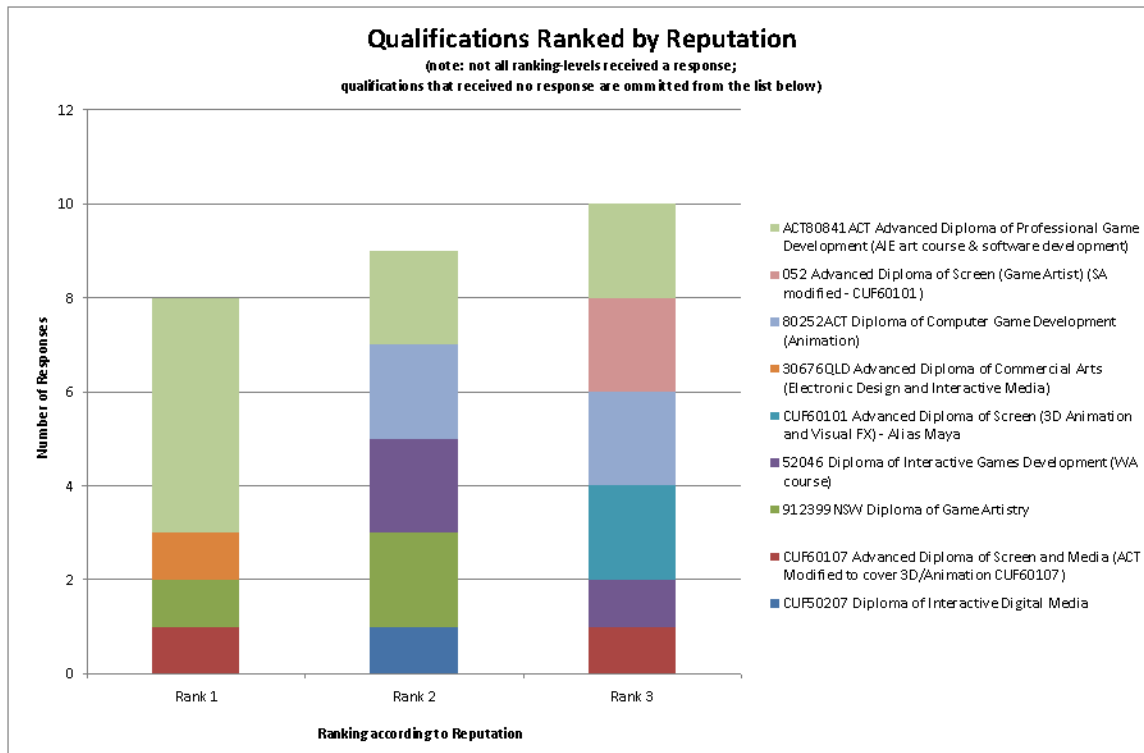


Table 11: Certificate 1-3 competencies sorted by most relevant

Certificate 1 -3 Competencies, sorted by Relevance	
Competency	Average Relevance
	5 = Very High, 1 = Very Low
CUFANM302A Create 3D digital animations	4.43
ICAA4058B Apply skills in object-oriented design	4.43
CUFANM303A Create 3D digital models	4.29
CUFDIG304A Create visual design components	3.86
CUFANM301A Create 2D digital animations	3.50
CUFWRT301A Write content for a range of media	3.43
CUFDIG302A Author interactive sequences	3.43
CUFDIG301A Prepare video assets	3.40
CUFDIG201A Maintain interactive content	3.33
ICAD4209B Write content for web pages	2.80
NSWTICA202A Use new media software packages	2.50
CUFDIG303A Produce and prepare photo images	2.40

Table 12: Certificate 4 competencies sorted by most relevant

Certificate 4 Competencies, sorted by Relevance	
Competency	Average Relevance
	5 = Very High, 1 = Very Low
CUFANM401A Prepare 3D digital models for production	4.33
ICAA4058B Apply skills in object-oriented design	4.14
ICAB4219B Apply introductory object-oriented language skills	3.86
ICAB4075B Use a library or pre-existing components	3.86
CUFPOS402A Manage media assets	3.83
CUFANM402A Create digital visual effects	3.83
ICAB4224B Apply mathematical techniques for software development	3.83
ICAB4225B Automate processes	3.83
ICAB4135B Create a simple mark-up language document to specification	3.75
ICAB4137B Produce basic client side script for dynamic web pages	3.75
(NSW Competencies)	3.67
70324 Design a Computer Game	3.67
ICAI4189B Ensure website content meets technical protocols and standards	3.67
CUFDIG404A Apply scripting language in authoring	3.60
CUFDIG402A Design user interfaces	3.57
CUFPPM404A Create storyboards	3.57
NSWTANM520A Digital editing for the 3D & digital effects environment	3.57
CUFDIG401A Author interactive media	3.50
CUFDIG403A Create user interfaces	3.50
70323 Review a Computer Game	3.20
CUFANM403A Create titles for screen productions	2.80

Table 13: Diploma and higher competencies sorted by most relevant

Diploma & Advanced Diploma Competencies, sorted by Relevance	
Competency	Average Relevance
	5 = Very High, 1 = Very Low
ICAA4058B Apply skills in object-oriented design	4.60
CUFANM501A Create 3D digital character animation	4.43
ICAB4219B Apply introductory object-oriented language skills	4.40
ICAB5226B Apply advanced object-oriented language skills	4.40
CUFANM502A Create 3D digital environments	4.29
ICAB4075B Use a library or pre-existing components	4.20
ICAITB170A Build a database	4.20
VBP024 Develop graphical user interfaces (GUIs) for virtual worlds	4.17
VBP026: Develop 3D environments for virtual worlds	4.17
CUFDIG505A Design information architecture	4.17
CUFANM503A Design animation and digital visual effects	4.17
CUFDIG506A Design interaction	4.14
VBN324 Create 3D characters for games	4.00
VBN326 Create design documents for games	4.00
NSWTGAM501A Produce 3D components for interactive games	4.00
NSWTGAM502A Design 3D game levels and environments	4.00
VBP025: Develop scripts for virtual worlds	4.00
BSBEBUS508A Build a virtual community	4.00
ICAITB182A Write and compile code, based on requirements	4.00
ICAITAD042B Determine client business needs	4.00
CUFDIG504A Design games	3.86
CUFDIG507A Design digital simulations	3.86
WA50661FTI08A Produce an interactive game project	3.86
WA50661FTI09A Design interactive game play	3.86
(NSW Competencies)	3.83
VBN323 Develop graphical user interfaces (GUIs) for games	3.83
WA50661FTI03A Identify and apply knowledge of game playing	3.83
VBN325 Create 3D environments for games	3.80
VBN327 Develop scripts for games	3.80
ICAITB181A Write and document program modules	3.80
ICAITT082A Manage the testing process	3.80
ICPMM61DA Prepare multimedia for different platforms	3.80
ICAITB137A Produce basic client side script for dynamic web pages	3.50
ICAITB068A Build using RAD	3.50
CUFDIG501A Coordinate the testing of interactive media products	3.43
CUFDIG502A Design web environment	3.40
ICPMM581B Manage multimedia production	3.40
CUFDIG503A Design elearning resources	2.67

5.2.1 Comment by question:

O-1) Comments or feedback on any job roles or occupations we should include as part of the digital games development sector?

- Can't think of any.
- 3D Rigger Game Engine Programmer

O-4) Comments or feedback on any national qualification we missed, or others we should examine?

- Can't see any missing.
- It is how they are delivered, not what is accredited in the curriculum

C1-5) Comments or feedback on endorsed competencies we have missed or titles we need to add?

- Database skills need to be considered in any software development course. Games is no exception. Please consider units to deal with knowledge base database unit(s). Also, Games Diploma course needs at least one more unit in OO Design area, could be called- "OO Design"

C4-9) Comments or feedback on endorsed competencies we have missed or titles we need to add?

- Add more units for Database Modelling and Design Also add at least one more unit in OO Design as OO is the main programming tool in Games programming.

CD-8) Comments or feedback on endorsed competencies we have missed or titles we need to add?

- At least one more unit in "Database Modelling and Design" area.

CD-9) Should there be an applied vocational graduate course?

Vocational Graduate Certificate

5 Responses: 5 YES ... 0 No

Vocational Graduate Diploma

5 Responses: 3 YES ... 2 No

CD-10) Is there a course you would suggest we should use as a model / benchmark for the vocational graduate qualification?

- A Certificate IV in Games Design [from WA] would be appropriate to have as that will give students an exit option from a 2 years long Diploma Course (eg. in NSW). Lot of students enrol into Games Diploma course with a lot of dream but along the way some find it difficult to cope with (especially in programming area). For those students it would help getting an exit with a Cert IV rather than dropping out without anything meaningful.
- Uni better for graduate but could do applied at grad cert level if relevant

5.2.2 Submitted feedback

The survey offered opportunities for confidential or public feedback. The public feedback included the following comments. Three contacts also provided additional reference materials to support their feedback.

Responses confirmed three standard games development sector job roles were not listed:

- 3D Rigger
- Game Engine Programmer
- Mobile games programmer

Feedback from TAFE WA confirmed four new competencies (in addition to the two listed from WA) were added in September 2009 when the *51767 Diploma of Animation* was reaccredited. These included:

- Manage Technical Art in 3D Animation
 - Create Web Browser Games
 - Create Games for Mobile Phones and PDAs
 - Create Game Audio
-

6. Conceptual design of a national qualification

6.1 Qualification structure

There would seem to be no compelling reason to heavily modify an existing Training Package derived qualification and seek National Quality Council (NQC) re-endorsement. In addition there seems to be little appetite with State Training Authorities to see more code changes and revisions to existing CUF07 Training Package implementation or purchasing guides, or with RTOs to implement any revisions that add more cost when games development is not a commercial focus.

While specific qualification and competency variations exist at state and territory level none meet Training Package authoring guidelines. Consistency and competitiveness in this important industry would argue for a national approach that closely references the best of the state-based courses and competencies.

While it is possible to work within what exists in national training packages to meet the growing demands of the digital games development sector it is recommended the more sustainable and less disruptive approach would be to develop a new qualification. To do this the design can enhance existing qualification pathways in both CUF07 and, potentially, ICA05. Existing competencies can be preserved while new competencies can be developed to meet this sector's needs while enhancing responsiveness to emerging vocational outcomes in 3D and interactive applications. In addition skill sets can be defined, packaged into existing qualifications and listed in both Training Packages.

- Recommendation 1: The current national qualifications in IBSA Training Packages do not satisfy current or future needs of the digital games development, 3D digital art, animation, or game programming needs. To give better coverage it is recommended a **Diploma in Digital Games Development and Interactive Applications** be developed. This may be complimented by a Certificate IV that is either a standalone qualification or an exit point within the Diploma.
- Recommendation 2: New units of competency should be written to enhance coverage of skills and knowledge required in the areas of digital content creation, games development, 3D and digital art, animation, and virtualisation.
- Recommendation 3: Career pathways should be promoted that are broader than the games development sector by ensuring qualifications provide core competencies and elective streams allowing specialisation in vocational pathways that already exist or are emerging.
- Recommendation 4: Entry level qualifications in CUF07 and ICA05 should be enhanced to better promote not just the foundation or essential skills in new media and digital content creation, but to promote articulation of graduates from these qualifications into further learning and work relating to the digital games development and 3D and interactive media vocational outcomes.
- Recommendation 5: The skill sets identified as relating to games development, game art, animation and programming should be embed within the proposed qualifications and endorsed as part of a national Training Package.

6.2 Qualification Design

On the following pages a conceptual layout for two new qualifications has been presented. The design reflects research, feedback and survey work that has confirmed the vocational outcomes and competency requirements for the digital games development industry, game art, animation, programming and emerging areas of 3D digital media and interactive applications.

All detail is provided as a basis for further development and discussion. This report captures all competencies and any decision on final inclusions would be part of subsequent development and validation work. It is acknowledged many of the 60 new or modified competencies may be merged or omitted. It needs to be remembered their relevance extends beyond just games development. Many competencies will be included in the early 2010 update to the ICA05 IT Training Package.

The following should be noted:

- The template used (NTIS2) is as required by the National Quality Council
- Existing national codes from competencies in Training Packages has been preserved (eg. commence with CUF, ICA BSB).
- The code 'NEW' has been used to show possible new competencies. The following GAM indicates it is for digital games and 3D media. The next number signifies AQF level (eg. NEWGAM4XXA means New Games competency at AQF level 4, XX sequence to be determined and it will be the first 'A' version when authored).
- NEWICA coding has been used to signify new competencies already proposed in the parallel project to update the ICA05 Training Package.
- All qualification rules have been shaped to comply with future changes to the NQC's requirements for more flexibility in endorsed qualifications.
- In brackets at the end of new competencies the code for any relevant, existing state or national competency has been listed.

(CUF40707) Certificate IV in Digital Game Development & Interactive Applications

Descriptor

This qualification reflects the role of individuals who use well-developed skills and a broad knowledge base in a wide variety of contexts across digital game development, 3D art, animation and related programming activities. They apply solutions to a defined range of predictable problems, and design and develop digital solutions suitable for multiple platforms, delivery technologies and communication networks.

Job roles

Job roles and titles vary across different industry sectors. Possible job titles relevant to this qualification include:

- Games development assistant
- Digital artist
- Animator
- 3D animator
- 3D modeller
- 3D texture artist
- 3D renderer
- Composer
- Renderer
- Technician interactive elements
- Virtual world design assistant
- Virtual environments artist

Qualification pathways

Prerequisites

There are no prerequisites for this qualification.

Pathways into the qualification

Candidates may enter the qualification with limited or no vocational experience and without a relevant lower level qualification.

Licensing, legislative, regulatory and certification considerations

There are no licensing, legislative, regulatory or certification issues that affect this qualification

<p>Qualification rules</p> <p>Total number of units = 13</p> <p>3 core units plus</p> <p>10 elective units</p> <p>5 elective units must be selected from the list below. The remaining 5 elective units may be selected from the elective units listed that commence with 'NEWGAM'; the elective units listed from either CUF07 Screen and Media Training Package or the ICA05 Information Technology Training Package; or any other currently endorsed national Training Package. If not listed below, a maximum of 1 unit may be selected from a Certificate III level qualification and 2 units from a Diploma level qualification.</p> <p>The electives are grouped into 12 specialist streams. For the purposes of specialisation a candidate will need to complete 3 units of competency listed under a specialist stream.</p> <p>Electives must be relevant to the work outcome, local industry requirements and the qualification level.</p>
<p>Core units</p> <p>Creative thinking</p> <p>BSBCRT301A Develop and extend critical and creative thinking skills</p> <p>Industry context</p> <p>CUFIND301A Work effectively in the games and interactive digital media industries</p> <p>OHS</p> <p>BSBOHS201A Participate in OHS processes</p>
<p>Elective Units</p> <p>Game Design</p> <p>NEWGAM4XXA Identify and apply principles of game design and game playing (VMEM09A & WA50661FTI03A)</p> <p>CUFDIG504A Design games</p> <p>NEWGAM4XXA Design interactive game play (WA50661FTI09A)</p> <p>NEWGAM4XX Create design documents for games</p> <p>Creative Process</p> <p>NEWGAM4XXA Write content and story for a game</p> <p>NEWGAM4XXA Create visual design components for games and/or interactive media</p> <p>CUFPPM404A Create storyboards</p> <p>Digital Media Design</p> <p>NEWGAM4XXA Design visual elements for a 3D and/or digital effects environment</p> <p>NEWGAM4XXA Design interactive media</p> <p>NEWGAM4XXA Design and 3D model</p> <p>Game Art</p> <p>NEWGAM3XXA Apply simple modelling techniques</p> <p>NEWGAM3XXA Design and apply simple textures to digital art</p> <p>NEWGAM4XXA Design and apply 3D imagery, animation and texture mapping</p> <p>NEWGAM4XXA Use simple modelling for 3D animation</p> <p>NEWGAM4XXA Design digital art for mobile games or applications</p> <p>Animation</p> <p>NEWGAM3XXA Review and apply the principles of animation (NSWTANM414A)</p> <p>NEWGAM4XXA Create 3D characters for games (VBN324)</p> <p>CUFANM301A Create 2D digital animations</p> <p>CUFANM302A Create 3D digital animations</p>

CUFANM303A Create 3D digital models
CUFANM401A Prepare 3D digital models for production

3D & Digital Effects

CUFANM402A Create digital visual effects
NEWGAM4XXA Prepare game audio
NEWGAM4XXA Prepare and complete rendering processes
NEWGAM4XXA Apply digital effects to an interactive product (NSWTANM521A)
NEWGAM4XXA Produce an interactive game (WA50661FTI08A)

Interface and Environment

NEWGAM4XXA Apply digital texturing for the 3D environment
(NSWTANM406A)
NEWGAM4XXA Develop simple graphical user interfaces (GUIs) for games
(ICAB4178B & VBN323 & VBP024)
NEWGAM4XXA Develop simple 3D environments for games (VBN325 & VBP026)
NEWGAM4XXA Develop 3D components for games and/or interactive media (NSWTGAM501A)

Programming

NEWGAM4XXA Develop scripts for a game (VBN327 & VBP025)
NEWGAM4XXA Create Games for Mobile Phones and PDAs
NEWICA4XXA Apply mathematical techniques for programming (proposed for ICA10)
ICAA4058B Apply skills in object-oriented design
ICAB4219B Apply introductory object-oriented language skills

Software Development

NEWGAM4XXA Implement changes to game software
ICAB4224B Apply mathematical techniques for software development

Database development

NEWGAM5XXA Analyse and determine database functionality and requirements to support an online
game (ICAA5147B & ICAB4060B)
NEWGAM4XXA Build a database to support a game (ICAB4170B)
ICAB4136B Use structured query language to create database structures and manipulate data

Web Development

ICAB4135B Create a simple mark-up language document to specification
ICAB4137B Produce basic client side script for dynamic web pages
ICAI4189B Ensure website content meets technical protocols and standards

Game production and Testing

CUFDIG501A Coordinate the testing of interactive media products
ICAITT082A Manage the testing process
ICPMM61DA Prepare multimedia for different platforms
ICPMM581B Manage multimedia production

Management & Work

NEWICA3XXA Learn to adapt and deploy emerging and new technologies or applications
NEWICA3XXA Undertake basic market research for a small IT business (proposed for ICA10)
NEWICA3XXA Manage IT business consulting and services ((proposed for ICA10)
BSBSMB304A Determine resource requirements for the micro business
BSBSMB305A Comply with regulatory, taxation and insurance requirements for the micro business
BSBFIA301A Maintain financial records
BSBFIA303A Process accounts payable and receivable

CUF50807 Diploma in Digital Game Development & Interactive Applications

Descriptor

This qualification reflects the role of individuals who possess a sound theoretical knowledge base and use a range of specialised, technical or managerial competencies to develop digital games and 3D media for multiple technologies and industries.

Job roles

Job roles and titles vary across different industry sectors. Possible job titles relevant to this qualification include:

- Games developer
- Games engineer
- Animator
- Digital games art specialist
- 3D Animator
- 3D Modeller
- 3D Texture artist
- 3D character animator
- Technical assistant (3D and cross sectional mapping)
- Simulations designer
- Simulations developer
- Simulations engineer
- 3D environment renderer
- Level designer
- Composer
- Rendering specialist
- Digital media specialist
- Interaction media developer
- Interactive design programmer
- Interface Designers
- PC games programmer
- PS2 lead programmer
- Software engineer games
- Software support engineer
- Mobile games programmer
- Mobile applications developer
- Technician interactive elements
- MMOG Technician
- Virtual environments developer
- Virtual World Designers

Qualification pathways

Prerequisites

There are no prerequisites for this qualification.

Pathways into the qualification

Candidates may enter the qualification with limited or no vocational experience and without a relevant lower level qualification.

Licensing, legislative, regulatory and certification considerations

There are no licensing, legislative, regulatory or certification issues that affect this qualification

<p>Qualification rules</p> <p>Total number of units = 23</p> <p>3 core units plus</p> <p>20 elective units</p> <p>9 elective units must be selected from the list below. The remaining 11 elective units may be selected from the elective units listed; the elective units listed from either CUF07 Screen and Media Training Package or the ICA05 Information and Communication technology Training Package; or any other currently endorsed national Training Package. If not listed below, a maximum of 1 unit may be selected from a Certificate III level qualification and 2 units from a Diploma level qualification.</p> <p>The electives are grouped into 12 specialist streams. For the purposes of specialisation a candidate will need to complete 3 units of competency listed under a specialist stream.</p> <p>Electives must be relevant to the work outcome, local industry requirements and the qualification level.</p>
<p>Core units</p> <p>Creative thinking</p> <p>BSBCRT301A Develop and extend critical and creative thinking skills</p> <p>Industry context</p> <p>CUFIND301A Work effectively in the screen and media industries</p>
<p>Elective Units</p> <p>Game Design</p> <p>NEWGAM5XXA Design 3D game levels and environments (NSWTGAM502A)</p> <p>CUFDIG504A Design games</p> <p>NEWGAM4XXA Design interactive game play (WA50661FTI09A)</p> <p>NEWGAM4XX Create design documents for games</p> <p>Creative Process</p> <p>NEWGAM5XXA Create design concepts for digital games and 3D media</p> <p>NEWGAM4XXA Write content and story for a game</p> <p>NEWGAM4XXA Create visual design components for games or interactive media</p> <p>CUFPPM404A Create storyboards</p> <p>Digital Media Design</p> <p>CUFANM503A Design animation and digital visual effects</p> <p>CUFDIG502A Design web environments</p> <p>CUFDIG503A Design elearning resources</p> <p>CUFDIG505A Design information architecture</p> <p>CUFDIG506A Design interaction</p> <p>CUFDIG507A Design digital simulations</p> <p>NEWICA5XXA Design interactive 3D maps or models (proposed for ICA10)</p> <p>NEWICA5XXA Integrate multiple data sources into a 3D map or model</p> <p>NEWICA5XXA Design interactive computer applications for scientific and mathematical modelling (proposed for ICA10)</p> <p>Game Art</p> <p>NEWGAM5XXA Develop and use textures for the 3D and/or digital effects environment (NSWTANM515A & NSWTANM406A)</p> <p>NEWGAM5XXA Design and create advanced particles, fluids and bodies for 3D and/or digital effects environment (NSWTANM502A)</p> <p>NEWGAM5XXA Design and create models for the 3D & digital effects environment (NSWTANM507A)</p> <p>NEWGAM5XXA Create and implement designs for the 3D and/or digital effects environment</p>

(NSWTANM503A & NSWTANM504A)

Animation

NEWGAM5XXA Create complex 3D characters for games (VBN324)

NEWGAM5XXA Animate a 3D digital character
(CUFANM501A & NSWTANM509A & NSWTANM510A)

NEWGAM5XXA Animate appropriate physical attributes of models and elements for 3D & digital effects environment (NSWTANM511A)

NEWGAM5XXA Create and combine 3D components (NSWTANM508A)

NEWGAM5XXA Manage technical art and rigging in 3D Animation

NEWGAM5XXA Produce an animation and/or digital effects sequence (NSWTANM514A)

3D & Digital Effects

CUFANM402A Create digital visual effects

NEWGAM5XXA Create an interactive digital product (NSWTANM521A)

NEWGAM5XXA Create an interactive game (WA50661FTI08A)

NEWGAM4XXA Create game audio

NEWGAM5XXA Complete digital editing for the 3D and digital effects environment (NSWTANM520A)

NEWGAM5XXA Render complex digital effects and environments (NSWTANM506A)

NEWGAM5XXA Complete compositing to create elements for the 3D and digital effects environment
(NSWTANM512A)

NEWGAM5XXA Generate finished digital 3D maps and models

Interface and Environment

CUFANM502A Create 3D digital environments (VBP026 & VBN325)

NEWGAM5XXA Develop graphical user interfaces (GUIs) for games (ICAB4178B & VBN323 & VBP024)

NEWGAM5XXA Develop graphical user interfaces (GUIs) for virtual worlds

NEWGAM5XXA Render components for interactive games and environments (NSWTGAM501A)

Programming and Software Development

NEWGAM5XXA Write script using software embedded language for the 3D and digital effects environment (NSWTANM513A)

NEWICA5XXA Apply mathematical techniques for advanced programming (proposed for ICA10)

NEWICA5XXA Design interactive computer applications for scientific and mathematical modelling
(proposed for ICA10)

NEWGAM5XXA Create complex code for Mobile Phones and/or PDA games

ICAA4058B Apply skills in object-oriented design

ICAB4075B Use a library or pre-existing components

ICAB4219B Apply introductory object-oriented language skills

ICAB5226B Apply advanced object-oriented language skills

ICAITB182A Write and compile code, based on requirements

NEWGAM5XXA Develop software for games or interactive media

ICAB5071B Review developed software

Database development

NEWGAM5XXA Design a database to support online games (ICAA5139B)

NEWGAM5XXA Model data objects and processes for a game (ICAA5153B & ICAA5154B)

NEWGAM5XXA Integrate database with online game (ICAB5180B)

Web Development

ICAB4135B Create a simple mark-up language document to specification

ICAB4163B Create a common gateway interface script

ICAB4137B Produce basic client side script for dynamic web pages

ICAI4189B Ensure website content meets technical protocols and standards

ICAA5146B Develop website information architecture

Game production and Testing

CUFANM401A Prepare 3D digital models for production

CUFDIG501A Coordinate the testing of interactive media products

NEWGAM5XXA Manage the testing of games and/or interactive media (ICAITT082A)

NEWGAM5XXA Prepare games for different platforms and delivery modes (ICPMM61DA)

NEWGAM5XXA Create technical documentation for games or interactive media (ICAD4217B)

Management and Work

NEWGAM5XXA Manage game and/or interactive media production (ICPMM581B)

NEWGAM6XXA Manage digital media production and business processes

BSBPMG510A Manage projects

BSBFIM501A Manage budgets and financial plans

6.3 Skill sets

Research on national skill sets conducted for this report has made parallel findings with those in IBSA's Stage 1 scoping review of the ICA05 ICT Training Package (IBSA, 2009a). The skill sets that emerged reflected three areas of primary demand that are directly relevant to the games development industry:

1. Foundation or essential skills in new media and web content creation
2. Programming for Games and 3D Interactive Media; and
3. Advanced Programming for Virtual Games and 3D environments

New Media and Web Content Creation 'Essential Skills'	
<p>This covers the mix of competencies required to undertake basic Internet use and effectively engage young people and new users to web applications and the collaborative creation and exchange of online content.</p> <p>Why?:</p> <ol style="list-style-type: none"> 1. Foundation IT/Digital literacy agenda 2. This is an essential skill to close the digital divide and enables participation on the digital economy 3. Promotes access by Australians seeking to engage in use of the NBN 4. To shift the focus of young people to more engaging use of digital and creative media <p>AQF Level: 2</p>	<p>ICAB4169B Use development software and IT tools to build a basic website (may need to be modified to cover Wiki, etc.)</p> <p>ICAD4209B Write content for web pages</p> <p>AQF 2 Use new media software packages (NSWTICA202A)</p> <p>AQF 2 Use mobile devices and tools to capture and share digital content</p> <p>CUFDIG201A Maintain interactive content</p> <p>Create and share content using collaborative Web tools (NEW)</p> <p>Use authoring tool to create web content (includes digital video, audio, text and images/graphics; could incorporate ICAD2012B)</p> <p>Programming</p> <p>Use simple script (NEW AQF 3)</p>
Programming for Games and 3D Interactive Media	
<p>Specialist programming career paths (verticals) have disappeared. Instead programming specialisations have been 'off shored' and programmers need to mix their core skill set with other specialist streams. Programmers need to up-skill to enter new and emerging work opportunities. have</p> <p>Why?:</p> <ol style="list-style-type: none"> 1. Need to leverage programming for <ul style="list-style-type: none"> • Games developers • Simulations • Film and special effects • Advertising • Geo-spatial mapping (mining industry especially) 	<p>Design</p> <p>CUFPPM404A Create storyboards</p> <p>CUFDIG402A Design user interfaces</p> <p>CUFDIG504A Design games</p> <p>CUFDIG506A Design interaction</p> <p>CUFDIG507A Design digital simulations</p> <p>Animation/3D</p> <p>CUFANM501A Create 3D digital character animation</p> <p>CUFANM502A Create 3D digital environments</p> <p>CUFANM503A Design animation and digital visual effects</p> <p>NEWGAM4XXA Develop scripts for a game</p> <p>ICAB4219B Apply introductory object-oriented language skills</p> <p>ICAB4224B Apply mathematical techniques for software</p>

<p>AQF Level: 5</p>	<p>development NEWGAM5XXA Analyse and determine database functionality and requirements to support an online game NEWGAM4XXA Build a database to support a game Testing CUFDIG501A Coordinate the testing of interactive media products New (non) games NEWICA5XXA Design interactive computer applications for scientific and mathematical modelling NEWICA5XXA Design interactive 3D maps or models NEWICA5XXA Integrate multiple data sources into a 3D map or model NEWGAM5XXA Generate finished digital 3D maps and models</p>
<p>Advanced Programming for Virtual Games and 3D environments</p>	
<p>This skill set is to allow programmers to acquire the skills and knowledge required to access new job opportunities in the digital games development, game art, animation, and areas requiring more complex programming skills.</p> <p>Why?:</p> <ol style="list-style-type: none"> 1. Massive 'off shoring' of programming jobs to India and China 2. Increasing complexity of high end virtual and interactive games 3. Vertical career pathway in programming truncated and need new 'vertical' pathways 4. Opportunities in niche areas but labour demand insufficient and so dynamic need flexible approach to skilling <p>AQF Level: 5-6</p>	<p>Design CUFDIG506A Design interaction CUFDIG507A Design digital simulations Games/ Virtual worlds NEWGAM5XXA Create and implement designs for the 3D and/or digital effects environment NEWGAM5XXA Create complex 3D characters for games CUFANM502A Create 3D digital environments Development NEWGAM5XXA Write script using software embedded language for the 3D and digital effects environment NEWGAM5XXA Design a database to support online games ICAB5226B Apply advanced object-oriented language skills NEWICA5XXA Apply mathematical techniques for advanced programming NEWGAM5XXA Prepare games for different platforms and delivery modes</p>

7. References

- Australian Bureau of Statistics (ABS) (2006a). *Catalogue No. 1220.0 Australian and New Zealand Standard Classification of Occupations*. Canberra: ABS.
- Australian Games industry 2009 <<http://www.gamesindustry.biz/articles/game-sector-sees-8-percent-growth-in-australia-throughout-2009>>
- ABS (2006b). *Catalogue No. 1292.0 Australia and New Zealand Standard Industrial Classifications*. Canberra: ABS.
- ABS (April 2008). *Catalogue 8515.0: Digital Game Development Services, Australia, 2006-07*. Canberra: ABS. Available online at <<http://abs.gov.au/AUSSTATS/abs@.nsf/Lookup/8515.0Main+Features12006-07?OpenDocument>>
- Australian Interactive Media Industry Association (AIMIA) (April 2005). *Digital Content Industry Roadmapping Study*. Dandolopartners. Accessed November 2009 at <http://www.aimia.com.au/i-cms_file?page=1455/Digital_Content_Roadmapping_Study_FINAL_AIMIA_Version.pdf>
- Brand J.E. (2007). *Interactive Media 2007 Detailed Report: For use by IEAA Members*. The Centre for New Media Research Bond University. Interactive Entertainment Association of Australia (IEAA): Sydney.
- Bryant, R. (29 March 2009). Game sales explosion drives growth, mart Company. Sourced June 2009 at <<http://www.smartcompany.com.au/Premium-Articles/Industry-Trends/20080328-Game-sales-explosion-drives-growth.html>>
- Cavalli, E. (19 November 2008). Study: PC Gaming Market Larger Than Console, *Wired*. Sourced December 2009 at <<http://www.wired.com/gamelifelife/2008/11/study-pc-gaming/>>
- Conroy, S. (15 July 2009). *Australia's Digital Economy: Future Directions*. Minister for Broadband, Communications and the Digital Economy. Ministerial Speech. Sourced July 2009 at <<http://www.minister.dbcde.gov.au/media/speeches/2009/034>>
- Crossley, R (26 January 2009). Global Game Sales Overtake DVD/Blu-Ray, *Edge*. Sourced May 2009 at <<http://www.edge-online.com/news/global-game-sales-overtake-dvdbluray>>
- Cultural Ministers Council (CMC) (February 2009). *Building a Creative Innovation Economy Opportunities for the Australian and New Zealand creative sectors in the digital environment Progress Report*. Canberra: Cultural Ministers Council Creative Innovation Economy Roundtable. Sourced 7 December 2009 at <http://www.cmc.gov.au/__data/assets/pdf_file/0006/87342/Building-a-Creative-Innovation-Economy---Progress_update.pdf>
- Centre for International Economics (30 June 2009). Creative Industries Economic Analysis Final report. Enterprise Connect and the Creative Industries Innovation Centre (CIIC): Canberra. Sourced July 2009 at <http://www.enterpriseconnect.gov.au/OurServices/Documents/Economic%20Analysis_Creative%20industries_Final%20Report_240909.pdf>
- Department of Communications, Industry Technology and the Arts (DCITA) (2006). *Unlocking the Potential. Digital content Industry Action Agenda*. Canberra: Commonwealth of Australia. Sourced May 2008 at <http://www.dbcde.gov.au/__data/assets/pdf_file/0006/37356/06030055_REPORT.pdf>
- Haukka, S. (June 2009). *60Sox Report Volume 1: From Education to Work in Australia's Digital Content Industries: The opinions and practices of aspiring creatives in the Creative Industries*. Institute for Creative Industries and Innovation, Queensland University of Technology & Australian Research Council. Sourced 6 November 2009 at <<http://www.cci.edu.au/sites/default/files/shaukka/60Sox%20Survey%20Report%20Volume%201%20June%202009.pdf>>
- Higgs, P.L. & Kennedy, T. (2004). From Cottages to Corporations: Access to Overseas Markets for Australia's Creative Digital Industry. In: *Creative Industries Cluster Study Volume 3*. Australian Government Department of Communications, Information Technology and the Arts, Canberra ACT, pp.

127-304. Sourced May 2008 at
<http://www.cultureandrecreation.gov.au/cics/Access2Markets_FP.pdf>

- Innovation and Business Skills Australia (IBSA) (December 2009). *IBSA 2010 Environmental Scan (eScan)*. IBSA: Melbourne.
- IBSA (6 December 2009a). *Final Report: Stage 1 Scoping Review of the ICA05 ICT Training Package*. Draft. Melbourne: IBSA.
- International Game Developers Association (February 2008). *IGDA Curriculum Framework The Study of Games and Game Development*. version 3.2 beta. Games Development Special Interest Group. Sourced 8 November 2009 at <<http://wiki.igda.org/images/e/ee/Igda2008cf.pdf>>.
- Knight, S.J. & Brand, J.E. (June 2008). *History of Games Development in Australia*. Australian Centre for Moving Images (ACMI), Centre for New Media Research & Education, Bond University and Multimedia Victoria. Sourced 12 November 2009 at <http://www.acmi.net.au/explore_history_oz_game.htm>.
- Multimedia Victoria (October 2009). *Computer Games*. Fact Sheet. Multimedia Victoria. Available online at <<http://www.mmv.vic.gov.au/Assets/2326/1/VictorianGovernmentGamesFactSheetOctober2009-2.pdf>>
- Nolan, J. (2008). Are games bigger than movies?, *Venture Chronicles*. Sourced January 2009 at <<http://jeffnolan.com/wp/2008/04/17/are-games-bigger-than-movies/>>
- NSW Department of State and Regional Development (2008). *NSW Creative Industry: Economic Fundamentals*, Sydney. Sourced June 2009 at <http://www.business.nsw.gov.au/NR/rdonlyres/7407D6D6-FB7A-41A7-8824-5154B671CEBE/0/NSW_creative_industry_economic_fundamentals_090204.pdf>
- PriceWaterhouseCoopers (PWC) (2009). *Global Entertainment and Media Outlook: 2009-2013: Australia*. Sourced July 2009 at <<http://www.pwc.com/gx/en/global-entertainment-media-outlook/index.jhtml>>
- Skills Victoria (2008). *Cultural and Recreation Industry Training Needs Profile*. *The Cultural and Recreation Industry in Victoria*. Skills Victoria: Melbourne. Sourced November 2009 at <http://www.skills.vic.gov.au/_data/assets/pdf_file/0017/23408/Cultural-and-Rec-Industry.pdf>
- TasIT (December 2008). *Tasmanian ICT Skills Report 2008*. Hobart: TasIT and CIER.
- VERVE (February 2009). *Skills Needs Report for the Victorian Culture and Recreation Industries*, Victorian Cultural and Recreation Industry Training Board: Melbourne. Sourced 11 December 2009 at <http://verve.org.au/assets/38/Final_Skills_Needs_Report.pdf>

Reference sites

- Portal: The digital game industry in Australia <<http://www.cultureandrecreation.gov.au/articles/digitalgames/>>
 - Cultural Ministers Council (CMC) <<http://www.cmc.gov.au/publications/>>
 - ARC Centre of Excellence for Creative Industries and Innovation <<http://cci.edu.au>>
 - Games Developers' Association of Australia <<http://www.gdaa.com.au>>
 - The American Entertainment Software Association <<http://www.theesa.com>>
 - The International Game Developers Association <<http://www.igda.org>>
 - International Games Development Association Curriculum Knowledge Base <http://igda.org/wiki/index.php/Curriculum_Knowledge_Base>
 - Interactive Game and Entertainment Association <<http://www.igea.net>>
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- UK SkillSet the Sector Skill Council for the Creative Media Industry <<http://www.skillset.org>>
 - Games Queensland <<http://www.queenslandgames.com>>
 - Multimedia Victoria <<http://www.mmv.vic.gov.au/Games>>
 - Perth Independent Game Makers Initiative <<http://pigmi.org/page/home>>
 - Perth IGDA Chapter <<http://www.igda.org/perth>>
-

8. Acronyms

ABS	Australian Bureau of Statistics (http://www.abs.gov.au)
AIMIA	Australian Interactive Media Industry Association (http://www.aimia.com.au)
AIIA	Australian Information Industry Association (http://www.aiia.com.au)
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ANZSIC	Australian and New Zealand Standard Industry Classification
AQF	Australian Qualifications Framework (http://www.aqf.edu.au/)
AQTF	Australian Quality Training Framework (http://www.training.com.au/aqtf2007/)
CMM	Curriculum Maintenance Manager (http://trainingsupport.otte.vic.gov.au/cmminf.cfm)
DEEWR	Department of Education, Employment and Workplace Relations (www.deewr.gov.au)
GDA	Games Developers' Association of Australia (http://www.gdaa.com.au).
HDD TV	High Definition Digital TV
ICT	Information and Communications Technology
ISC	Industry Skills Council (http://www.isc.org.au)
IBSA	Innovation and Business Skills Australia (http://www.ibsa.org.au)
IGDA	International Game Developers Association (http://www.igda.org)
IP TV	Internet Protocol Television
IT	Information Technology
MMOG	Massive Multi-play Online Game
MMORPG	Massive Multi-play Online Role Playing Game
NCVER	National Centre for Vocational Education Research (http://www.ncver.edu.au/)
NQTC	National Quality Council
NBN	National Broadband Network (http://www.dbcde.gov.au/funding_and_programs/national_broadband_network)
PSX	Sony Playstation
RPL	Recognition of Prior Learning
RTO	Registered Training Organisation
SFIA	Skills Framework for the Information Age (http://www.sfia.org.uk)
VCD	Video CD
VET	Vocational Education and Training

Training Package including:

CUF07	Screen and Media Training Package
ICA05	IT Training Package
ICP05	Printing & Graphic Art Training Package
BSB07	Business Services Training Package
ICT02	(soon to be ICT10) Telecommunications Training Package

9. Attachments

Attachment 1: Australian games companies

The following is an illustrative rather than exhaustive list of companies Working Futures was able to confirm from a review of listings under games and animation providers with ASIC and state company registers or Yellow Pages. The list excludes any professional associations, collaborative communities, industry bodies or companies without a web address or company registration that could be authenticated at the time of publishing.

Table 14: Digital games and 3D media companies Australia

VIC	
1. BigAnt Studios	http://www.bigant.com
2. Bluetongue Entertainment	http://www.bluetongue.com
3. Endgame Studios	http://www.endgamestudios.com
4. Firemint	http://www.firemint.com
5. Infinite Interactive	http://www.infinite-interactive.com
6. Third Wave Games	http://www.thirdwavegames.com
7. Iron Monkey Studios	http://www.ironmonkeystudios.com
8. Jumbuck Entertainment	http://www.jumbuck.com
9. Playscape Games	http://www.playscapedgames.com
10. Red Moon Games	http://www.redmoongames.com
11. Tantalus Media	http://www.tantalus.com.au
12. Torus Games	http://www.torus.com.au
13. Visual Jazz	http://www.visualjazz.com.au
14. Wicked Witch Software	http://www.wicked-witch.com.au/
15. Wontom	http://www.wontom.com
16. Everyday Interactive Networks	http://www.ein.com.au
17. Game Mechanic	http://www.thegameconsultants.com
18. Millipede Creative Development	http://www.millipede.com.au
19. Touch My Pixel	http://www.touchmypixel.com
20. Sector3 (unknown address)	http://games.sector3.com.au
QLD	
21. Auran	http://www.auran.com
22. Halfbrick	http://www.halfbrick.com
23. Liquid Animation	http://www.liquidanimation.com
24. THQ Studio Australia	http://www.thqstudioaustralia.com
25. 3D Blokes Studio	http://www.3blokesstudios.com
26. Curious Bear Productions	http://www.curiousbearproductions.com
27. FreshTone Games	http://www.freshtonegames.com
28. Hoodlum	http://www.hoodlum.com.au

29. Kawow	http://www.kawow.com
30. Krome Studios	http://www.kromestudios.com
31. Mocket	http://mocket.com
32. Sega Creative Assembly- Australia	http://www.creative-assembly.com.au
33. Valhalla Studios	http://www.conclavecreations.com/valhalla
34. Virtual Mechanix	http://www.virtual-mechanix.com
35. Wildfire Studio	http://www.wildfire.com.au
36. Wired Developments	http://www.wireddevelopments.com
NSW	
37. Animal Logic	http://www.animallogic.com
38. Envisage	http://www.envizage.com.au
39. Team Bondi	http://www.teambondi.com
40. Microforte (Sydney)	http://www.microforte.com
41. Viva La Mobile	http://www.vivalamobile.com
42. Catflap Animation	http://www.catflap.com.au
WA	
43. Interzone entertainment	http://www.interzoneentertainment.com
44. Black Lab Games	http://blacklabgames.com.au
45. Rocket Hands	http://rockethands.com
SA	
46. StarPlayIt	http://www.starplayit.com
47. The People's republic of Animation	http://www.thepra.com.au
48. Sydac	http://www.sydac.com.au
49. Hollowpoint	http://www.hollowpoint.com.au
Tasmania	
50. Blue Rocket	http://www.blue-rocket.com.au
51. MATS4D Design	http://www.mats4d.com/main.shtml
52. Remedia	http://www.remmedia.com.au/remedia.html
53. Autech (virtual walkthroughs)	http://www.autech.com.au
ACT	
54. Micro Fortè	http://www.microforte.com

Attachment 2: List of people consulted

The consultancy brief required 8 industry 'experts' be confirmed and contacted regarding the relevance and importance of the national qualifications and competencies. The list of industry experts was compiled with input from many of those listed below. However, any omissions or oversights are entirely the fault of the consultants and the process of consultation for this 'snapshot' research report should not be considered exhaustive.

	Person and organisation	Consultation type
1.	Mike McNabb COO Game Developers Assoc of Aust	S, SR, I, E
2.	Justin Brow 60Sox	S, SR, I, E
3.	David Giles Chief Operating Officer Tantalus Media	S, I
4.	Glendon Pryor Head of IT (Link to HunterTech games developers) Hunter Institute Faculty of Business and Computing	S, SR, I, E
5.	Adrian Janson Melbourne High President of the Victorian Information Technology Teachers Association	S, SR, I
6.	Nirmal Chowdhury Head Teacher, Information Technology NSW Tafe	S, SR, I
7.	Bruce Jenkins Head of School, AIE Melbourne Neil Boyd, Head of School, AIE Sydney The Academy of Interactive Entertainment Ltd	S, S
8.	Robert Walsh Chief Executive Officer Krome Studios	S
9.	Ross Symons Big Ant Studios	S
10.	Jane 'Truna' Turner	S, SR, I, E
11.	Shainiel Deo ex VP of GDAA CEO Halfbrick	S
12.	Alex Peters Community Manager Firemint	S, E
13.	Steve Fawkner CEO Infinite Interactive	S
14.	John Andrius Tasmanian Polytechnic Media North	S, SR, I, E
15.	John Dunton Curriculum Maintenance Manager Arts/Entertainment & Recreation Swinburne University of Technology	S, SR, I
16.	Richard Lancaster Principal Lecturer Digital Content Portfolio Central College of TAFE (WA)	S, SR, I, E
17.	Mark Wilson Lecturer/coordinator Digital Media Design (Game Art) TAFE (SA)	S
18.	Andy Hawkins Central Institute of Technology (WA)	S

	INDUSTRY OR GOVERNMENT BODIES	
19.	Mark Fludder Information Industries Bureau Employment and Economic Development Department of Employment, Economic Development and Innovation	I, E
20.	Australian Interactive Multimedia Industry (AIMA) Coverage of Digital Media industry CEO John Butterworth	I
21.	Bob Snedden Executive Officer Communications ITAB NSW	I
22.	Mel Brenton Executive Director Service Industries Training Advisory Council	I
23.	Wendy Moulds Executive Officer NT Cultural, Recreation & Tourism Training Advisory Council	I
24.	Sam Nicolosi General Manager Creative Industries Skills Council	I
25.	Graham Oades Executive Officer Services Skills SA	I
26.	Genevieve Wearne Executive Officer Victorian Cultural and Recreation Industry Training Board	I, E
27.	Alex Frazer Executive Officer Victorian Electro-Technology, Printing, Information and Communications ITB	I, E
28.	Zoe Nichols Industry Manager Future Now	I

Key: Survey sent; SR = Survey registration; I = Interview over the phone; E = Email submission.

Attachment 3: Registered 3D / Animation Schools in Australia (all sectors)

Sourced 4 December 2009 at
<http://www.creative-3d.net/3dlinks/showschools.cfm?country=Australia>

Academy of Interactive Entertainment, Ltd.
PO Box 131, Phillip Ave.
Watson ACT 2602
Phone: +(61) 2 6162 5131
enquiries@aie.act.edu.au
<http://www.aie.act.edu.au>

Hamilton Adult Campus
815 Marion Rd.
Mitchell Park South 5043
Phone: +61 8 8275 8300
Fax: +61 8 8277 9380
info@hamcoll.sa.schools.edu.au
<http://www.hamcoll.sa.edu.au/>

Australian Film and Radio School
Dept. of Digital Media
Cnr Balaclava & Epping Roads
North Ryde New South Wales 2113
Phone: 612 9805 6611
Fax: 612 9887 1030
digimedia@aftrs.edu.au
<http://www.aftrs.edu.au>

Holmesglen Institute
585 Waverley Rd.
Glen Waverley Victoria 3150
Phone: (+61 3) 9564 1948
intl@holmesglen.vic.edu.au
www.holmesglen.vic.edu.au

Centre for Animation & Interactive Media
Dept. of Visual Communication
Melbourne Victoria 3001
Phone: +(61) 3 9925 5206
Fax: +(61) 3 9925 3356
rhonda.smithies@rmit.edu.au
<http://www.rmit.edu.au/aim/>

Institute for Design
512 Stanley Street
South Brisbane Queensland 4101
Phone: +(61) 7 3846 7133
info@ifd.net.au
<http://www.ifd.net.au>

Centre for New Media Arts
Peter Karmel Building 121, Childers St, Acton
Canberra ACT 0200
Phone: +(61) 2 6125 5640
cnma@anu.edu.au
<http://www.anu.edu.au/newmedia>

JMC Academy - Melbourne
169 Bank St
South Melbourne VIC 3205
Phone: +61 (03) 9696 4117
enquiries@jmc.net.au
<http://www.jmc.net.au>

Charles Sturt University
Locked Bag 588, Boorooma St.
Wagga Wagga NSW 2678
Phone: +(61) 2 69332589
vkendall@csu.edu.au
<http://www.csu.edu.au/svpa>

JMC Academy - Sydney
41 Holt St,
Surry Hills NSW 2010
Phone: +61 (02) 9281 8899
enquiries@jmc.net.au
<http://www.jmc.net.au>

Golden Fleece
POBox 2133, Tuggeranong
Canberra ACT 2901
Phone: +(61) +612 6231 1566
mythology@golden-fleece-australia.org
<http://www.golden-fleece-australia.org>

Moving Ideas Animation
13 Sutherland St Lane Cove
Sydney NSW 2066
Phone: +(61) 02 9427 9775
jan@movingideasanimation.com
<http://www.movingideasanimation.com>

Griffith University
Queensland College of Art Animation PO Box 84
Morningside QUEENSLAND Q 4170
Phone: 61 7 3875-3112
Fax: 61 7 3875-3199
qcainfo@qca.gu.edu.au
<http://www.griffith.edu.au/faculty/qca/>

Ngapartji Multimedia Centre
211 Rundle Street
Adelaide South 5000
Phone: 61 8 82320839
Fax: 61 8 82321771
enrol@ngapartji.com.au
<http://www.ngapartji.com.au>

QANTM College
Level 13 - QANTM House 138 Albert St
Brisbane Queensland 4000
Phone: +61 (0)7 3017 4333
enquiries@qantmcollege.edu.au
<http://www.qantmcollege.edu.au>

Queensland College of Art
226 Grey St
South Brisbane Queensland Q 4101
Phone: +(61) 7 3875 3112
QCA_enquiry@griffith.edu.au
<http://www.gu.edu.au/>

Royal Melbourne Institute of Technology
Media Arts Dept. of Visual Communication
Melbourne
Phone: 613 9660 3728
Fax: 613 9660 3728
I.HAIG@rmit.edu.au
<http://minyos.xx.rmit.edu.au/~rafih>

SAE Institute - World HQ
373-391 Ewingsdale Road
Byron Bay New South Wales 2481
Phone: 1800-SAE-EDU
infobyron@sae.edu
<http://www.saebyronbay.com>

SAE Technology College Adelaide
GPO BOX 10411,Level 2/282 Gouger St
Adelaide South 5000
Phone: +(61) 8 8410 6599
saesa@senet.com.au
<http://www.sae.edu/>

School of Multimedia Systems
Monash University
Melbourne Victoria 3806
Phone: +(61) 3 9904 7127
multimedia@infotech.monash.edu.au
<http://www.multimedia.monash.edu.au>

Silicon Studio Training Centre
Level 2, Norwich Union Building 143 Coronation
Drive
Milton Queensland 4064
Phone: 011 61 7 32 913 300
practopi@siliconstudio.com.au
<http://www.siliconstudio.com.au>

Southbank Institute Of Technology
120 Clearview Terrace Morningside
Brisbane QLD 4170
Phone: +(61) 13 72 48
ian.southbank@gmail.com
<http://www.sbit-animation.com/>

Swinburne University of Technology
Industrial Sciences John St Hawthorn
Hawthorn Victoria 3122
Phone: +(61) 3 9214 5161
Fax: +(61) 3 9214 8650
tafeind@swin.edu.au
<http://www.swin.edu.au>

TAFE NSW - Sydney Institute
110 Edgeware Road
Enmore New South Wales 2042
Phone: +(61) 2 9217 5431
Sit.BusinessCentre@tafensw.edu.au
<http://www.sit.nsw.edu.au/enmore>

The n Centre for the Arts & Technology
National Institute of the Arts Building 121
n National University
Canberra 0200
Phone: +61 2 6125 5640
acat@anu.edu.au
<http://www.anu.edu.au/ITA/ACAT>

The Computer Graphics College
Level 2/52 William St
East Sydney NSW 2011
Phone: +612 9361 5511
daniel_todd@cgc.com.au
www.cgc.com.au

The MAD Academy
128 Hindley Street
Adelaide South 5000
Phone: 61 8 8221 5884
sam@truelife.com.au

VFX Mentor
30 Highland Ridge
Middle Cove NSW 2068
Phone: +(61) 2 99678655
only@vfxmentor.com
<http://www.vfxmentor.com>

Victorian College of Arts
School of Film and Television 234 St. Kilda Road
Southgate Victoria 3006
Phone: 613 9685 9020
Fax: 613 9685 9001
ftv.info@vca.unimelb.edu.au
<http://www.vca.unimelb.edu.au/ftv>
