Australian Game Development Education: 
An Analysis of Industry Perceptions

By

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Abstract

This research explores how Australian game development education (GDE) is perceived by the Australian games industry. The global game development industry is yet to fully mature and, as a result, a reliable GDE program structure is yet to be developed. The validity of such programs has been questioned repeatedly by industry representatives, most notably in the UK. The general attitude of the game development industry toward GDE courses is that they are, in general, not fit for purpose and are perceived as misguided, ineffective and misaligned with industry skill requirements. While some literature exploring the skilling of Australian GDE graduates has been published, detailed analysis of Australian industry views about GDE is, at present, lacking. Given the recent significant downsizing of the Australian games industry, it is important to discover precisely what, in the uniquely Australian context, the local games industry requires of GDE programs and their graduates now and in the future.

The primary aim of this research is to determine the Australian games industry perspective on GDE. To achieve the aims of this research, views from members of the Australian games industry at a senior, mid and junior level were canvassed using a mixed methods approach (incorporating qualitative and quantitative data sources). The first phase of the research involved a quantitative analysis of survey results which determine broad industry attitudes to GDE and, in a supplementary capacity, student perceptions of industry roles and practices. The second phase of the research involved the qualitative analysis of interviews conducted with senior industry figures. This phase explored industry perceptions of GDE, skill and education preferences and the role of GDE in the future of Australian game development.

The research reveals that unsatisfactory interaction with educators has influenced industry’s perception of GDE. It also reveals industry’s preference for non-GDE-specific graduates, the prioritisation of improved business practice (e.g. seeking effective funding models) over the need to hire graduates in the short term, and the industry’s uncertainty surrounding the role of GDE in the longer term. These findings are significant in that they can aid future GDE course structure and content, and provide some insight into how the needs of the local games industry can be met. They also highlight the need for alternative and mutually beneficial means of industry
collaboration and offer some sense of the direction industry will take in the coming
decade.

**Keywords:** Video Games, Australian games industry, tertiary education, graduate opportunities
CHAPTER ONE

Introduction

1.1 Background

Video games are a global phenomenon. Games are found on everything from handheld devices such as smartphones to dedicated gaming consoles and computers. Games are ubiquitous and range substantially in complexity, cost, style and audience. Video games are a creatively, culturally and economically significant medium advanced by an industry that has grown from hobbyist origins to rank as the largest entertainment medium in the world (Whitehead, 2012).

Globally, the annual revenue from game software and hardware sales is estimated to reach USD$82 billion by 2017 (Gaudiosi, 2012). The recently released video game *Grand Theft Auto V* drew over USD$1 billion in sales within 72 hours of launch (Nayak, 2013). For the larger franchises, sales figures approaching this mark are not uncommon. The number of gamers worldwide (include those that play games on mobile devices) is predicted to rise to 1.55 billion in 2013 (Takahashi, 2013). The United States is currently the largest console gaming market with 49% of households owning at least one dedicated gaming device and an average household owning at least one device (such as a smartphone or PC) capable of use as a games platform (ESA, 2012). Elsewhere, China’s online PC gaming market alone exceeds 180 million players (Lu, 2012).

Locally, Australia’s game development industry is estimated to be worth approximately AUD$2.5 billion by 2015 (Brand, 2012, p. 19). It is reported that 98% of Australian households contain at least one game-capable device (including PC). Sixty-three percent (63%) of households contain at least one dedicated games console (Brand, 2012, p.6). Industry-wise, the number of game developers and those employed in a related capacity in Australia’s commercial game development studios reportedly exceeded 1,400 as of 2008 (ABS, 2008), though recent studio closures have reduced this number to 581 (Pink, 2013).
The contrast between the considerable growth in global game development and the downsizing of the Australian industry at first seems counterintuitive, but the diminishing game development middle ground (locally speaking) has accompanied a substantial increase in local (and global) independent development (Parker, 2011a). Given this global emergence of independent game development, the current circumstances may in fact be a natural progression for an industry whose middle ground is rapidly eroding (Stuart, 2012). This affects the nature of available game development jobs globally, but particularly so in local industry.

In addition, Australia’s serious game development sector is still in relative infancy but is growing (Tay, 2010). This sector includes edugames and advergames as identified by Smith and Sawyer (2008). Game development offers a meaningful contribution to the global creative economy. Games are now arguably afforded similar cultural status to music and film through institutions such as BAFTA (Martin, 2013). Funding bodies for more traditional media such as film offer grants to game developers to produce original local content (Film Victoria, 2012). The support of such groups assists in recognising and legitimising games as valid creative artifacts.

A position in the game development industry can be reasonably considered a serious professional vocation. Tertiary institutions have established dedicated game design and development courses to meet the growing need for developers; reported estimates suggest the global games industry revenue will increase as much as 33% between 2012 and 2016 (Takahashi, 2013). There are now universities and colleges worldwide that offer dedicated game design and development qualifications, including DigiPen and University of Southern California in the United States (Cox, 2012), and Academy of Interactive Entertainment (AIE, 2013) and Queensland and Northern Territory Multimedia (QANTM) in Australia. In the UK alone, some 141 university-based game development courses produced over 1500 graduates between 2008 and 2009 (Stuart, 2011). Many universities also offer game development related units attached to a more traditional degree, such as a Bachelor of Computer Science (Deakin, 2013).

Academics have participated in the growth of games through a growing body of research dedicated to the study of modern games (Parberry, 2007, p.1). In response to this growth, tertiary institutions have implemented game development-themed
education programs that range widely in style, structure and content and attract healthy numbers of student enrolments. In recent years however, concerns have been raised by games industry figures as to the validity and effectiveness of these courses, specifically pertaining to graduates being competently skilled and adequately prepared for a role in the game development industry (Chapple, 2012a) (Humphries, 2008).

1.2 Game Development Education (GDE)

Despite the numerous forms of game development-themed education programs now available, such courses have only existed formally for approximately 15 to 20 years; the University of Abertay claims to have created the world’s first recognised games course (StudyLink, 2013), though precursors to modern game development courses are referred to in published literature (Parberry et al., 2011, p. 4). Australian universities that offer game development courses include Swinburne, RMIT, LaTrobe University, Deakin University, Bond University and Queensland University of Technology, while several private game development colleges operate in Australia including Qantm (Queensland and Northern Territory Multimedia) and AIE (Academy of Interactive Entertainment) (Tsumea, 2013).

Any of the more traditional disciplines such as medicine, engineering or information technology typically require graduates seeking a career in those industries to have attended a tertiary educational institution in order to acquire the skills, knowledge and qualifications required by that industry. These disciplines also tend to feature professional accreditation from industry bodies to ensure consistent standards are applied across institutions. At any given time, these university or college graduates are preparing to enter a particular professional field. In that regard, game development is no different. However, there are several unique aspects of game development and game development education that warrant consideration in prelude to a larger discussion about GDE. These include the notion that game development is interdisciplinary (Rocca et al., 2002), games courses are often developed in an ad-hoc manner, often attached to traditional computer science courses (Parberry, 2011, p.4) and the game development industry has expressed concern over the quality of current GDE courses (Chapple, 2012a) (Humphries, 2008) (Swain, 2009) (Haukka, 2011).
Game development comprises numerous disciplines, roles and skill sets, so determining a single overarching definition that encompasses every role of a development team is problematic; as a result no universally agreed upon definition exists. What can be defined are aspects of game development. A key distinction that can be made between game development and most other disciplines is that game development is *interdisciplinary* (Rocca et al., 2002) (Sturtevant et al., 2008, p. 383).

The typical composition of a game development studio includes: programmers (of varying types and specialisations), artists (concept artists, technical artists, 3D modelers, animators, texture artists), audio engineers (scoring, effects, dialogue) and designers (lead designers, level designers, gameplay designers) (Sturtevant et al., 2008, p. 383). The variety and differing nature of these roles means that game development draws from both artistic and technical fields. Educators face difficulties in attempting to satisfy industry skill requirements for each of these roles in a single course (Argent, Fajardo, Gjertson, Leutenegger, Lopez, Rutenbeck, 2006) (Brown, Lee, Alejandre, 2009).

The relative infancy of game development education programs suggests an educational model that is yet to mature, as acknowledged by the International Game Developers Association (IGDA, 2008). Efforts have been made to formalise a common model for game development course structure through the IGDA; the most recent revision to this model was in 2008 (IGDA, 2008). Parberry (2011) notes that aside from the handful of dedicated GDE colleges, many game development courses within universities begin as an addition to an existing degree, citing a generally ad-hoc approach to GDE curricula. Further, the speed at which the game development industry continues to develop and adopt new development techniques, technology, and new platforms (and varying modes of content delivery) (Blow, 2004) (EDGE, 2007, p. 73) makes implementation of an effective GDE program a difficult moving target.

Concerns have been raised by both developers (Humphries, 2008) and educators (McGill, 2008) about the standard of education aspiring developers receive in game development courses and the validity and applicability of these programs. The quality and validity of course offerings have come under repeated scrutiny from industry figures (Chapple, 2012a) (EDGE, 2013, p. 73) (EDGE, 2007, p. 80). The games industry, in need of skilled developers, found the capabilities of new graduates to be
less than satisfactory (Humphries, 2008) and asserted the need for industry and education to align their approaches to GDE (Stuart, 2011). In some cases, criticism from industry has been blunt:

“95% of video gaming degrees are simply not fit for purpose. Without some sort of common standard, like Skillset accreditation, these degrees are a waste of time for all concerned ... We are facing a serious decline in the quality of graduates looking to enter the industry ... The dearth of maths, physics and computer science graduates is hitting us hard.”

David Braben (Humphries, 2008)

Robert Swan, at the time of comment a lead programmer with NiK NaK, expressed his concern about the quality of graduates emerging from dedicated game development courses:

“I’m becoming pretty critical of a lot of games courses out there. I get a lot of people with a CV that says “I’ve done x, y and z”, and it looks good, but you get them in and they’ve done nothing in their spare time. The degree is representing what is being taught and the interview is wasted... I’ve started being in touch with various universities and they’re fertile places. A lot of them want to be steered in the right direction – they just don’t know where they’re going, so they’re picking a direction and the graduates are unemployable.”

Robert Swan (EDGE, 2013)

Locally, Australian developers have also expressed concern over the validity of games courses. A 2011 study by Dr Sandra Haukka found 84% of industry survey respondents considered games courses to be highly ineffective (Haukka, 2011, p. 47).

The key issue that emerges from an initial analysis of the views offered globally by industry on GDE is that GDE courses (and graduates of these courses) are apparently failing to meet the standards required of the games industry. Few examples of a specifically Australian origin exist (beyond a handful of exceptions, most notably the aforementioned 2011 report by Haukka) that clearly illustrate the issues with game development on a local level. Determining how the Australian games industry broadly
perceives local GDE courses, specific concerns they have with those courses, how those concerns developed and the requirements they have where GDE courses are concerned; these form the principle areas of enquiry for this research.

1.3 Research Aims

The aim of this research is to explore the Australian games industry’s perspective of GDE on a range of topics, including discussion of the perception of GDE, preferred skillsets of prospective developers and the future of Australian game development pertaining to the role of education. Three major stakeholders are involved in this discussion:

- Educators (those that develop, implement and run game development courses);
- Industry (those that produce commercial games), and;
- Students (those who aspire to become professional developers so seek to enrol in a tertiary game development course).

Though each stakeholder’s view is relevant, the content of this research is limited to the industry view. Doug Church of Valve declared students as the most important stakeholder in the game development sphere (Church, 2007); while they may be the most important stakeholder, this research identifies industry as the most influential stakeholder of the three in this particular context. The games industry ultimately dictates what is and is not valued and relevant in terms of skillsets and qualifications. While the educator view is also undoubtedly valid in this context, in order to limit the scope of the discussion it was deemed appropriate to analyse the industry perspective with appropriate depth. The student group is represented through the collection of data from student respondents but is considered supplementary to the industry view. Figure 1.1 illustrates the relationship between the three stakeholders pertaining to this research.
While the outcomes of this research may be generalisable beyond Australia, the focus of this research is local given the unique game development landscape that exists in Australia. Therefore, the utility of any research outcomes is, first and foremost, intended for a local audience.

### 1.4 Research Questions

This thesis explores game development education from an industry perspective specifically in the Australian context. Discovering precisely how industry perceives GDE and why necessitates consideration of several factors. Among these are the role of GDE as seen by industry, the skills expected of graduates by industry and the role of education in the future of Australian game development. An earlier study (see Chapter 3: Methodology, Section 3.8.1), review of literature and personal experience as a student in a GDE course led to the formulation of the following three research questions:

1. *How are Australian game development courses perceived by the Australian games industry and why?*
2. What is the preferred educational background of the average Australian game development graduate seeking a game development career?

3. How can Australian game development courses service the needs of industry in the future?

In answering these questions, the contribution made by this research to the existing body of knowledge is threefold: defining the Australian games industry’s perception of Australian GDE courses (specifically regarding industry-education interaction) and the causal factors underlying this perception; discovering the preferred educational background and skillset of graduates, and; exploration of the local industry’s future (and the role of GDE in that future, including suggested approaches to facilitate future education-industry collaboration to aid the relevance of GDE-based courses).

1.5 Research Approach

In order to answer the stated research questions, it is necessary to frame the Australian game development education scene from an industry perspective. This research therefore features three distinct phases;

1. A preliminary study in which members of industry, government and education were interviewed in order to contribute to the formation of the lines of enquiry used during the data collection phase.

2. A review of existing GDE literature, exploring the theoretical underpinnings of GDE through review of education theory and drawing from literature that is thematically linked to GDE in order to identify the gaps in GDE literature.

3. A data collection and analysis phase that draws upon input from industry figures (both employer and employee), and students.

Initially, the aforementioned preliminary study was conducted to gather information about the research topic and help to inform a specific set of research questions; this consisted of interviews with educators, developers and government representatives. The results of this preliminary study, combined with review of GDE-related literature,
led to the formation of the research questions as stated in Section 1.3 and were also used to guide the design of the larger, more specific study.

The third phase of this research has been conducted using a mixed methods approach. Given the exploratory nature of this research, qualitative data constitutes the primary data source. Quantitative data collection is used in a supplementary role, lending statistical weight to the qualitative findings and providing a broader sample than is possible with qualitative data alone.

1.6 Significance of Research

This research offers a meaningful contribution to the relatively sparse literature on game development education, specifically in the Australian context. It is intended to be used as a resource that educators can use to enhance GDE course content and to better understand the industry perspective with regard to industry-education relations.

This research is of value to each of the key stakeholders in the field of game development education. It forms a valid starting point from which educators can potentially improve courses that are game development focused and hopefully allow those educators to avoid the potential problems that game development presents in an educational context. For developers, it offers the opportunity to express their thoughts, concerns and suggestions about how the effectiveness of GDE courses might be improved. Students are perhaps the key beneficiaries of the outcomes of this research. If an outcome of this research is an improved likelihood of employment in the games industry through better industry-education understanding and subsequently improved relevance of courses and content, then game development students would also benefit.

This research is significant in the following ways:

- It presents an industry perspective of game development education and the problems with it as determined by the Australian games industry.
- It identifies an ideal graduate skillset.
It explores the nature of the relationship between developers and educators and, more broadly, the Australian game industry and Australian tertiary institutions that offer game development courses.

- It explores possible solutions as to how the concerns of industry might be addressed.

This research is also significant in that it contributes to a relatively sparse field of research. McGill (2008, p. 89), Claypool and Claypool (2005, p. 123) and Ip (2012, p. 5) highlight the lack of literature on game development education and the lack of formal or informal guidelines for the development of tertiary based game development courses. Much of the literature related to game development has focused on games as educational tools and games themselves as a means of enticing students into Computer Science courses or improving engagement levels of existing students (Wang and Wu, 2009) (Claypool and Claypool, 2005) (Cliburn and Miller, 2008).

1.7 Chapter Summary

The role of this chapter is to provide a brief outline of the genesis of this research, the area of research, the aims and objectives of this research, the research questions, the research approach to answering the research questions and the outcomes to be generated from this research. It also highlights the key stakeholders in this research, how they are linked, the role they play in achieving the proposed outcomes of this research and their role as beneficiaries once these outcomes are achieved.

The validity of game development courses at a tertiary level is asserted through the scale of the industry, the growth of games as a viable cultural and creative medium and the number of GDE courses available. This research seeks to ask how game development education is perceived by industry and to contribute an improved understanding of GDE to a body of GDE-specific literature that is relatively under-represented academically. The gap in literature on this topic is significant, further asserting the validity of the research topic. A detailed exploration of Australian GDE, encompassing the relationship between tertiary institutions and industry, student perceptions of game development, the suitability of current course offerings and the
sustainability of the current situation (for all concerned) is the specific focus of this research.

This research explores the industry perspective of Australian GDE, potential issues with existing courses and the role of GDE in Australia now and in the future. Aside from achieving the key research aims as detailed in Section 1.3, outcomes of this research may be used as impetus to improve vocational GDE as an educational path, to assist in enabling improved access to the game industry for graduates and to provide the Australian games industry with skilled, high quality graduates. The following chapter - Chapter Two: Literature Review - presents the existing literature on and relevant to GDE, identifying gaps in the understanding of GDE and providing a foundation for the data collection and analysis phases of this research (chapters Three, Four and Five respectively). Chapter Six: Conclusion presents the outcomes of this research and provides a summary of possible areas of future research.
CHAPTER TWO

Literature Review

2.1 Introduction

Game development courses have existed in one form or another from as early as 1993 (Parberry et al., 2011). Since that time, game development education (or GDE) courses have appeared globally to meet the demand for a career in the game development industry. Locally there are currently 29 active GDE course operating in Australia (Tsumea, 2013). Given that GDE courses have existed in any form for only two decades (and have only become more formalised in the last decade), it is reasonable to suggest that GDE is relatively immature in terms of tertiary education. It was also, until recently, uncommon to find game development literature and dedicated game development publications; Parberry (2007) notes the lack of such published material some ten years from the inception of his own initial GDE program.

The games industry itself has only been in existence for some four decades (CNBC, 2006). In recent years, the growth of the industry is reflected in the coverage that studio closures have received; locally, the closure of Krome Studios was reported via numerous news outlets (Souri, 2010) (McMillen, 2010). The immaturity of GDE and the concerns raised by developers about the effectiveness of GDE necessitates review of the current literature on GDE. This chapter will explore the breadth of GDE literature in a global context in order to identify the gaps in understanding of GDE theoretically and practically. It will then specify issues with GDE in the Australian context given the local focus of the research.

This chapter will also incorporate coverage of broader educational theory and concepts potentially relevant to GDE; among these are some well-established pedagogical approaches, such as constructivism and behaviourism. Literature from these fields will be reviewed through the lens of GDE, drawing potential links between aspects of these theories and application in the GDE context. This portion of the
literature review is intended to act as grounding for future exploration of the theoretical underpinnings of GDE.

2.2 The Divide Between Industry and Education

Game development is and continues to be the subject of a growing body of academic research, but the focus of such research is typically concerned with the use of games and game development as tools to enhance student learning experiences. Topics include games as educational tools (Becker, 2007) and games as a means to stimulate the interest of computer science students and provide alternate means of teaching fundamental CSE concepts (Guimaraes and Murray, 2008) (Williamson Shaffer et al., 2005) (Rothschild, 2008) (Jones, 2000). These game-related activities and studies share a common trait, that being they are typically unconcerned with the practice of game development itself or the skilling of students aspiring to become game developers.

Before reviewing the existing GDE-related literature, it is important to establish some background information about the relationship between the games industry (both globally and locally) and academia. Demographic information about game development (company numbers, developer numbers) is limited to reports from organisations reporting on their country of origin. A 2009 ESA report revealed that some 32,000 people were employed as game developers in the United States (Siwek, 2010, p. 1) alone. UK developers numbered 9,010 as of 2010 (Meer, 2010), dropping by some ten percent since 2008.

In contrast, a 2013 report from the Australian Bureau of Statistics revealed that since 2008, the number of employed Australian game developers had dropped by nearly two thirds (from 1,431 to 581) while the number of game development companies had nearly doubled (45 to 84) (Pink, 2013). Figure 2.1 illustrates the decline of large studios and downsizing of the industry as a whole in Australia in recent years.
Given the number of developers working in their respective countries, the number of GDE courses currently operating, particularly in the UK, seems disproportionately high. This is supported by reviews and reports produced in recent years that detail the issues faced by industry in the UK. That the number of available courses is considered problematic by industry is illustrated in a 2008 report:

*The proliferation of games courses was not viewed favourably and the sheer volume of courses made it more difficult to identify those that were of a high quality. The very small number of skill sector council accredited courses did not help this situation* (Turbin et al., 2008, p. 3).

GDE course numbers in the United States stand at 385 as of this year, a record number of course offerings for GDE (Pitcher, 2013). The UK offered some 306 GDE courses as of 2010 (Ip, 2012, p. 2), while Australia features 27 active GDE courses (Tsumea, 2013). Several UK-based game developers felt that many such courses were a means of attracting students and revenue, offering little in the way of meaningful game development education (EDGE, 2007, p. 80). Toby Barnes, formerly of studio
Pixel Lab, notes the gradual accreditation of GDE programs but also states that only four of the then 300 courses had gained that accreditation at the time of publication (EDGE, 2007, p. 80). As of 2012, only six courses were accredited by the UK body Skillset (Ip, 2012, p. 3).

A review published by NESTA (National Endowment for Science, Technology and the Arts), a UK-based innovation charity, illustrated the concern held by industry about the quality of game development courses. The authors, most notably Ian Livingstone of Eidos, determined that a failing on the part of education was to blame for a decline in the UK’s ranking as a game developing nation. (Livingstone and Hope, 2011, p. 5). The report cites a lack of understanding on the part of education about the specific needs of the games industry, a need for increased awareness of the types of available game development roles (from both students and educators) and a general dissatisfaction from developers about the standard of available GDE graduates (Livingstone and Hope, 2011, p. 6). An earlier report reached much the same conclusion, noting in particular that many games courses were “repackaged or reconstituted from existing modules and did not come across as coherent, well designed or ideal for purpose” (Turbin et al., 2008).

UK-based developers are vehement in their criticism of the UK’s GDE courses (Chapple, 2012a) and offer the most accessible portrayal of the dissatisfaction with education evident elsewhere. It must be noted that steps are being taken via accreditation bodies (such as Train2Game and Skillset) to improve the quality and applicability of GDE programs in the UK (Ip, 2012, p. 31). In contrast, despite the high number of GDE courses available in the US, little direct criticism of United States-based GDE programs has been raised publicly. This may be due to a more effective and established relationship between industry and education which sees companies such as EA offering scholarships to aspiring developers (Electronic Arts, 2013), though a lack of data on the validity of US-specific programs means this is speculative. McGill (2012) notes that the United States currently lacks an accreditation body similar to the UK-based Skillset program and instead turns to less formal guidance in the form of the IGDA curriculum framework.
2.2.1 The Australian View

Australian game developers, like their UK counterparts, are also concerned about the quality of local GDE programs, though reported views from Australian developers on GDE programs and their effectiveness are scarce. A 2011 review of the Australian games industry includes a broad overview of Australian GDE courses. An industry survey and poll from that review that sought views on the state of GDE courses returned was made available to respondents. Eighty-four percent (84%) of poll respondents deemed GDE courses ‘highly ineffective’ while 50% of industry respondents deemed GDE course at least ‘somewhat ineffective’ (Haukka, 2011, p. 47). These figures indicate local developers’ dissatisfaction with Australian GDE courses and are consistent with the perceptions held by UK-based developers. The concern held by UK-based developers that GDE courses were often repackaged or attached to existing units or modules is reflected locally in a 2011 Australian VET report on innovation within several sectors including game development. In describing the state of Australian GDE, the authors noted that:

*Although there are many games-specific courses at VET and university levels now, according to respondents a large proportion are simply rebadged programming or arts courses with a couple of games units added...The rebadged courses were perceived by most respondents to produce graduates unlikely to be employed by games companies because, as a games company manager said, ‘they get taught the wrong tools, the wrong techniques, and don’t understand how the games industry works’* (Dalitz et al., 2011, p. 33)

These comments suggest that Australian developers share the concerns of their UK counterparts where the quality and utility of GDE courses are concerned. They also suggest a lack of consultation with developers when educators are designing GDE programs. Robert Walsh, then CEO of Krome, identified this lack of consultation during a 2003 committee hearing on Australia’s digital media industries. When asked to rate that standard of graduates emerging from GDE courses, he remarked:

“*Being really honest, I am the largest employer in Australia and I have no interaction with any of the government institutions when it comes to training and education. Not one of them comes and knocks on my door and asks me what*
I want... I think the educational institutions need to go to industry as a whole. The industry is at fault as well, as it should be saying, ‘Here is what we need coming out of them.’ My requirements are probably different from somebody else’s, but there should be some sort of general consensus that as a bare minimum they could come in and have basic skills in certain areas.”

(Walsh, 2003, p. 41)

Given the results of Dr Haukka’s 2011 report and comments made in the 2011 VET report, it would appear that little has changed locally since Walsh’s comments. Dalitz, Toner and Turpin (2011, p. 33) state that most teachers of Australian GDE programs have industry experience and maintain close contact with industry via surveys and conferences; this appears to be inconsistent with the results of Haukka’s survey and the earlier comments regarding the validity of rebadged courses. To date, it is difficult to identify specific criticisms at the local level beyond a general air of dissatisfaction with GDE-themed programs.

2.2.2 The Maturity of the Games Industry

The industry is yet to fully mature, so the drawbacks of industry practice (and their potential impact on determining industry requirements) merit inclusion in this discussion. Walsh’s comments indicate a measure of fault with industry’s approach to education and are supported by research on industry practice. Petrillo et al highlight the challenges faced by the game development industry, including poor time management and interdisciplinary communication issues (Petrillo et al., 2008, p. 710). The latter in particular remains a major focus of educators seeking to build dedicated GDE courses from scratch and is explored in Section 2.2.1.

The diversity of game development in terms of technology, platforms, skill sets and target demographics also hampers the identification of a definitive set of skill requirements for students. Sturtevant et al (2008, p. 386) note the difficulty of replicating industry models and input given the diversity in background of the developers with which they collaborated; this suggests a lack of a standardised methodology across the industry. Regarding interaction between education and industry, companies are often reluctant to engage with educators but individual
developers are enthusiastic about collaborating with educators and advising GDE students (Parberry et al., 2011, p. 16) (Swain, 2009, p. 195). Whether this reluctance to collaborate is borne of the stated dissatisfaction evident in the UK and Australia is unclear (though such a position might seem counter-intuitive), but this is perhaps further indication of the difficulty in defining precisely what game development companies need from education.

Swain clarifies some of the issues that hamper industry-education interaction, citing an expectation gap between the two groups (Swain, 2009, p. 195). Game developers operate in a fast paced environment where technology, technique and platform turnover are high (Turbin et al., 2008, p. 3). In contrast, educational institutions take a long term view and seek a sustainable set of tools and methods with which to develop student understanding. These incompatible timelines can leave developers surprised at the apparent inability of programs to adapt to recent advances in a short timeframe (Swain, 2009, p. 195) (Onen et al., 2011, p. 42). Swain frames this ‘culture clash’ from an education perspective, suggesting industry-education collaborative efforts would be better served if industry develops a better understanding of the education mindset (Swain, 2009, p. 195).

Other issues that hamper industry-education collaboration include a dearth of internships due to a perceived lack of value (Turbin et al., 2008, p. 4), a lack of readily available and pedagogically appropriate instructional materials (Onen et al., 2011, p. 46) and perception that educators are unable to keep pace with industry advancements (Turbin et al., 2008, p. 3). Ip (2012, p. 32) and Onen et al (2011, p. 42) identify a more fundamental divide between the two stakeholders, contrasting the skill-based needs of industry with the more holistic approach to education favoured by tertiary institutions which incorporates ostensibly non-game development elements such as critical thinking. McGill (2009, p. 129) asserts that unlike traditional computer science programs, formal research of the development of these programs is lacking.

The above raises some of the key issues faced by educator and developer alike. Based on these statements, it is reasonable to assume that the relationship between industry and education is fractured. Issues raised years before are, evidently, yet to be adequately addressed, though steps are being taken to improve GDE program utility. The combination of an industry that is yet to fully mature, the ad hoc nature of GDE
programs, the one-to-one nature of much existing industry-education collaboration and an apparent inability of either group to embrace and adapt to the limitations of the other leaves substantial gaps in the understanding of GDE for either group. While numerous examples of industry requirements exist, they vary widely enough that the industry perspective on GDE is still not entirely clear, beyond an apparently negative perception of GDE. That lack of clarity is exacerbated locally, with only a handful of published industry views on the apparent problems with GDE.

When compared with the broader STEM body of occupations and educational programs, clearly more mature than game development as a series of vocational and educational paths, it comes as little surprise that GDE is lacking a formalized industry-education framework. STEM educational programs and career paths still contend with issues typical of an immature discipline, such as diversity; approximately 9% of employees working in STEM occupations are female (CaSE, 2014, p. 43), very close to the reported 10.6% within Australian game development (ABS, 2008).

Given the evident dissatisfaction of developers with GDE programs both locally and abroad, review of the educational perspective is warranted. The education perspective should provide a balanced view of the known issues with GDE and serve to further highlight the apparent gaps in both knowledge and expectation. The following sections detail GDE-related research, typically from educators seeking to develop a GDE course. These include ideal GDE course structure, the key issues faced by GDE educators when developing a GDE program, the role of industry in program development, preferred graduate skillsets and perceptions, and an indication of future trends.

2.3 Interdisciplinary GDE and the Role of Industry

Many existing GDE courses are implemented as an addition to existing courses, typically in conjunction with a traditional computer science course. This is arguably the common approach, and discussion of how to fit game development content into an existing CSE course appears to constitute the majority of published GDE research. However, as established in Section 2.2, the efficacy of such courses has raised the ire of the games industry whose skilling needs extend beyond technical know-how. While
they share many commonalities, a key distinction between traditional computer science and game development is that game development is inherently interdisciplinary (Burns, 2008, p. 154) (Bourdreaux et al., 2011, p. 35). Few CS courses offer students the opportunity to collaborate with students outside of their immediate domain (Sturtevant et al., 2008, p. 384). Taylor and Baskett (2009) discuss the need for balance between creative design and functional design when either teaching or participating in game development. They assert that while a key component of the game development mechanism is software development, the creative aspect is so heavily woven throughout the overall process that it differs substantially from traditional software development on a number of levels.

Former professor at the University of Alberta and the former director of university relations for Electronic Arts John Buchanan’s thoughts on the need for an interdisciplinary approach is as follows:

"There are many attempts at building game courses across the academy. The games industry is a unique segment of the software engineering community; unique in that the teams that build the games are multidisciplinary. I receive a lot of requests to review courses in this area. My advice is always the same: make the course cross traditional boundaries; get engineers, artists and designers working together... If you have the flexibility to make the course multidisciplinary, then you must." (Sturtevant et al., 2008, p. 383)

An interdisciplinary course serves several industry skills needs:

- It allows students to effectively mimic the industry pipeline (Kessler et al., 2009, p. 536) and experience ‘real world’ development (Bourdreaux et al., 2011, p. 27);
- It allows students to build their interpersonal skills and interdisciplinary communication skills, a trait required by industry (Kessler et al., 2009, p. 535) (Sturtevant et al., 2008, p. 383) (Onen et al., 2011, p. 41) and identified as a shortcoming in numerous industry projects (Petrillo et al., 2008, p. 710);
- It affords students the opportunity to develop experience and understanding of disciplines besides their own, further aiding their
understanding of the development process (Wolz et al., 2007, p. 6) (Argent et al., 2006) (Zimmerman and Eber, 2001, p. 78).

Tran and Biddle encapsulate the importance of interdisciplinary collaboration in game development in their study of a serious game development team work process. They determine that, given the diversity of roles types within a typical game development environment, a game development project could not be successfully completed without a concerted collaborative effort from all team members (Tran and Biddle, 2008, p. 53).

2.3.1 Interdisciplinary, Cross-disciplinary or Multi-disciplinary?

Before exploring the interdisciplinary approach, defining precisely what interdisciplinary means in the GDE context is warranted in order to correctly identify appropriate terminology. Jessup (2007, p. 330) states that terms such as cross-disciplinary (Wolz et al., 2007), multi-disciplinary (Brown et al., 2009, p. 240) and interdisciplinary (Katchabaw et al., 2005) are used interchangeably across a number of articles, the authors of which share an approximate aim; to better replicate the studio environment. Salmons and Wilson identify distinctions between these terms:

![Figure 2.2 Definition of discipline terms (Salmons and Wilson, 2007)](image)

Figure 2.2 Definition of discipline terms (Salmons and Wilson, 2007)
In light of this definition, game development is indeed interdisciplinary because it combines disparate disciplines, rather than merely utilises them exclusively. Jessup (2007, p. 330) defines interdisciplinary collaboration in a patient care environment, but the outcomes remain the same; integration of separate disciplinary approaches into a single consultation (or project in the case of game development). While not suggesting that authors of GDE literature are in any way unaware of the precise meaning of these terms, their mixed use is cause for potential confusion as to precisely what an interdisciplinary course is and entails.

This confusion may be present in industry itself; Skrzyszewski et al (2010, p. 255) surveyed a number of industry representatives about the skills they valued in a graduate. Creativity and multi-disciplinary knowledge were identified as valuable traits, which contrasts with Kessler’s industry feedback that courses be interdisciplinary (Kessler et al., 2009, p. 535). Wolz uses the term cross-disciplinary exclusively when describing the structure of a GDE course, though the content description matches that of an interdisciplinary approach (Wolz et al., 2007), incorporating collaboration between students of different disciplines. While a relatively small issue, definition of terms aids the discussion about traits of the interdisciplinary course model.

### 2.3.2 Interdisciplinary GDE

A number of educators have recognised industry’s need for an increased focus on soft skills and have subsequently sought to develop genuinely interdisciplinary courses. A wholly interdisciplinary GDE course is an ideal preparation for students seeking a career in game development; Kessler et al (2009, p. 535) confirm industry’s preference that GDE courses be interdisciplinary. Rankin et al (2007, p. 2) suggest the emphasis within GDE courses has been on use of specific tools rather than the importance of teamwork and that a broad understanding of the development process is preferable. This assertion is supported by industry, which further emphasises the ephemerality of specific software and high level techniques (Dalitz et al., 2011, p. 33).

The pedagogical benefits of interdisciplinary programs are also noted by educators that develop interdisciplinary programs. Zimmerman and Eber (2001, p. 77) suggest interdisciplinary approaches allow themes of group dynamics and tolerance to
be explored with students, while Cross et al (2008, p. 249) cite the opportunity for students of different backgrounds to produce quality work by leveraging the capabilities of other disciplines. Educational concerns of a technical nature, such as finding an appropriate game engine that is pedagogically appropriate and industry relevant (Volk, 2008, p. 193), are perhaps less important than the application of an interdisciplinary framework. However, like games companies, institutions can range in size and resource availability, so implementations of interdisciplinary courses vary from institution to institution and are limited by several factors.

Brown et al (2009, p. 242) notes issues that developers of interdisciplinary courses have faced, including difficulties distributing coursework, balancing personalities, and balancing disciplines while teaching student teams from different disciplines. Argent et al (2006) details the difficulties of cross-faculty collaboration, citing traditional organisational barriers. At a higher organisational level, an interdisciplinary program faces a more complex approval process given more than one school is involved with the program (Kessler et al., 2009, p. 537). Further organisational issues were identified by Onen et al (2011, p. 40), in particular the fact that traditional obstacles were compounded by the need to spread teaching between faculties. McGill (2010, p. 263) cites the need for constant communication between departments and faculties engaged in the development of a cross-disciplinary (and cross-faculty) program.

Kessler et al (2009, p. 537) adds to these organisational barriers through noting the difficulty of finding staff with the required skillset, a particularly significant issue for smaller institutions (Aoki et al., 2005, p. 2). Given the broad range of skills typically found among a team of game developers, it is not expected that teaching staff possess sufficient capacity to adequately demonstrate some or all of these (Mikami et al., 2009, p. 7:1). Those staff teaching a GDE course may in fact be merely enthusiasts with a working knowledge of GDE’s numerous disciplines (Ritzhaupt, 2009, p. 3:2). These contributions highlight the value of industry involvement, where current developers can impart their domain-specific knowledge to students in areas where lecturers are inadequately equipped. These limitations are perhaps an example of the aspects of education that, as noted by Swain, frustrate the games industry (Swain, 2009, p. 192).
Despite these limitations, interdisciplinary programs are typically considered successful by the authors. Though they range in scope (from purely in-house CSE-based programs (Burns, 2008) to multi-school programs involving students from otherwise unrelated streams (Parberry et al., 2005)), review on interdisciplinary programs report increased student engagement and a more game development-appropriate model according to industry input. However, published literature detailing these efforts does not feature a common metric for success and a form of industry review or post-mortem is not evident.

Student feedback is used to determine the success of an interdisciplinary program in several instances (Cross II et al., 2008) (Bourdreaux et al., 2011, p. 36) and while industry input features in a handful of program implementations, it is rarely used as a means of testing the validity of a program. Sturtevant et al (2008, p. 386) summarise the difficulty in quantifying the effectiveness of a course, noting student feedback will not necessarily indicate the pedagogical goals of a course have been achieved (much less whether a course will produce effective graduates).

2.3.3 Industry Collaboration and Expectations

Much of the published GDE literature centres on development of fledgling courses derived from a CSE base and as such cannot be critiqued as fully fledged game development courses. However, many of the described courses do aspire at some level to produce graduates capable of working in the game development industry. As mentioned above, direct industry input is relatively rare. Estey et al (2009) for example utilise software engineering literature as a guide to industry perspective and refer to the work of Parberry as a guide to course structure. Parberry himself highlights the value of input from games industry representatives (Parberry et al., 2005, p. 94) though largely as a means of communicating to students, rather than in an evaluative capacity. Zyda et al (2008), Sturtevant et al (2008), Claypool et al (2005) and Skrzyszewski et al (2010) each use industry input as a guide to shape a particular course design or to inform a general GDE approach.

Industry veteran Doug Church states that game development is more than a backdrop for ‘real’ or perhaps traditional CSE education and game development is a
valid future for students (Church, 2007). Industry comments from the 2011 VET report refer to dissatisfaction with ‘rebadged’ courses such as that described by Estey; such courses appear to suffer from being halfway between a GDE course and a traditional CSE course (Dalitz et al., 2011, p. 33). Skrzyszewski et al acknowledge the lack of GDE literature when seeking specific recommendation about what to teach and how and utilise industry input to determine a set of industry requirements (Skrzyszewski et al., 2010, p. 250). However, they also state that a game design course is “not intended to be an exhaustive preparation for a particular job, but it can be a firm basis for an educational path leading to certain professions” (Skrzyszewski et al., 2010, p. 253).

This type of generalist approach is warned against by industry representatives who suggest qualifications from such courses lack utility in the wider employment market (Dalitz et al., 2011, p. 33) (Ip, 2012, p. 32). Kessler et al (2009, p. 541) mention the need to consider potential roles students of GDE courses might fill, citing the need to avoid ‘in-between’-style programs lest graduate employment opportunities be limited. Church raises further considerations for both industry and education when managing collaboration, including timing (developers in crunch mode will likely be unavailable even if willing to assist), longer term commitment (citing industry’s habitual short term view) and general scepticism (Church, 2007). He also notes that many game developers are self-trained, a possible source of scepticism about the value of academic collaboration.

An expectation of improved skillsets following the acquisition of a dedicated GDE qualification is evident in an interview with developer Colt McAnlis. McAnlis expressed an expectation that graduates of dedicated GDE courses would exceed his own abilities, given he is self-taught (Stewart, 2006, p. 2). He also indicates that the most successful GDE courses will be those that keep pace with industry development. This expectation gap as highlighted by McGill (2008, p. 90) and Swain (2009, p. 195) needs to be carefully managed when facilitating industry-education collaboration.

Lameman et al (2010, p. 134) makes in important distinction between the goals of academia (improving educational programs and conducting research on all aspects of games) and industry (return on investment from game production). This distinction is instructive in that the values of the two do not overlap and the needs of education directly include industry. Church echoes this view, suggesting that industry does not
have an obvious need for academic input (though notes the potential value of a common design vocabulary) (Church, 2007). The majority of interaction results from education approaching industry, seeking input on educational programs. Adversely, industry is not typically inclined to approach education (Lameman et al., 2010, p. 134), though individual developers demonstrate a seemingly altruistic desire to collaborate with educators (Swain, 2009, p. 195).

Swain offers a number of methods to facilitate effective industry-education collaboration, including mentoring, student showcases, contests in which developers can judge student submissions (Swain, 2009, p. 194); some of these are in evidence amongst published GDE literature (Zyda et al., 2008) (Parberry et al., 2005, p. 94). These methods of collaboration do not impinge heavily on developer time, noted as a precious commodity despite a potential desire to assist educators (Church, 2007).

Swain’s observation that companies tend to maintain a distance from education is consistent with industry’s sceptical view of GDE. As a result, Swain recommends a meta-organisation that industry can interface with, rather than the ad-hoc, one-to-one links typical of industry-education collaboration (Swain, 2009, p. 192). Given the significantly smaller size of the Australian industry, it’s unclear whether these approaches would prove effective. Regardless, exploration of further collaborative approaches (particularly in the local context) that achieve desired educational outcomes and do not impact negatively on developer time is warranted.

2.4 Skillsets and Student Perceptions

A significant proportion of industry advice on the skills required of new hires is devoted to the importance of interpersonal skills and interdisciplinary experience. In some cases developers have stated that they prefer graduates to have a broad, well rounded experience of the game development process, rather than focus on learning specific software packages (Dalitz et al., 2011, p. 33) (Onen et al., 2011, p. 41). The one-to-one relationships between industry and education and the pace at which industry moves are cause for diversity in views about industry skills requirements; Zyda et al (2008, p. 71) report that industry’s preference is for C++ programmers versus Java programmers, while a study by McGill (2008, p. 84) lists Java as a language considered important by
industry (perhaps reflective of an increased focus on mobile platform development (Ip, 2012, p. 6:7)). McGill also declares the need for qualifications to align with the needs of industry and in contrast to Dalitz and Onen, cites industry’s preference for technical skill development (in either art of programming domains) over experience with game development processes (McGill, 2009, p. 135). Several common technical and soft elements are repeated throughout literature over time:

- Interpersonal or soft skills (including teamwork, communication and interdisciplinary experience) (Brown et al., 2009) (McGill, 2008) (Argent et al., 2006);
- Art theory and foundational art skills (such as 2D illustration) (Ip, 2012, p. 6:8) (Zyda et al., 2008, p. 72) (Argent et al., 2006)

The aforementioned one-to-one relationships make quantifying courses that benefit from such relationships difficult. Broader studies of industry requirements provide enhanced insight to what industry as a whole seeks from graduates. McGill (2008) offers a summary of skills desired by industry, revealing a preference for technical skills (including C++, C# and Java) followed by supporting knowledge skills then soft skills, roughly consistent with GDE literature. Ip’s (2012, p. 7) report on GDE courses in the UK depict a similar scene and also specifies software packages graduates should be familiar with (including Autodesk and Adobe packages). That specific software packages are identified as important is contrasted with isolated industry comment such as the following from the 2011 VET report:

“The only thing that educators could give us is graduates [who] have a very broad base knowledge, with no particular skills at all... I’d much rather someone has broad knowledge and understands how things work at a very base level, than actually particularly knowing a package. We can adapt anyone that has the broad knowledge, to any package... Today it’s Maya, tomorrow it’s Max. Today it’s Adobe’s stuff, tomorrow it might be Microsoft stuff. These things change, and I think that’s one of the failings that I find, is that people are being particularly trained.”
While comments such as this do not necessarily preclude the use of specific software packages, they highlight an inconsistent message from industry about what is and isn’t of value. The IGDA offers a curriculum framework as a possible guide for educators as to the units and skills they could adopt as part of a GDE program, though to date this framework has not been validated through independent research (McGill, 2009, p. 131). Despite shortfalls in the parent-disciplines covered in UK GDE (specifically programming, art and design), courses do appear to be meeting industry skill requirements (in terms of course content) as stated (Ip, 2012, p. 30). Throughout this review, this assertion contrasts with industry criticism that said courses are not producing adequately skilled graduates. The industry/education gap, be it in expectation, skills or understanding, appears to still be in effect.

Ip reports that several dedicated GDE accreditation bodies (specifically Train2Game and Skillset) in the UK have awarded accreditations to a handful of GDE courses in the UK (Ip, 2012, p. 5), offering a means of identifying courses that meet industry requirements. At present, no such GDE-specific accreditation body exists in Australia. Haukka’s report on Australian game development summarises Australian game development skilling needs and reveals similar themes emerging over the course of the last decade; a need for courses to better reflect industry’s skill needs, improved interaction between industry and education providers and a need for students to have developed project management and communication skills (Haukka, 2011, p. 36). Evidently, these needs have not been satisfactorily met and a UK-style accreditation program may address these skilling needs.

2.4.1 Student Perception and the Need for Creativity

As one of the three stakeholders relevant to any GDE research, students are also, at first glance, the least influential (besides whether they enrol in a course or not). However, student perceptions and misconceptions about what game development is (Bayliss and Bierre, 2008), how the games industry operates and the challenges of game development are an important aspect of the GDE discussion. Game development has ballooned in terms of scope, complexity and is, in simple terms, difficult (Blow, 2004).
GDE literature suggests that students often face difficulties acclimatising to the realities of game development (Ip, 2012, p. 6:3).

A large proportion of GDE literature is based on games as a means of teaching CSE concepts to students and games-based assignments have proven an attractive option for students (Cliburn and Miller, 2008, p. 138) (Haden, 2006). Game development is an attractive proposition for many students who wish to make the transition from ‘player’ to ‘creator’; this is highlighted by Volk (2008, p. 195) as a conviction that students who played games were already ‘domain experts’. Estey et al observed that students were attracted to a CSE course with a game development focus (Estey et al., 2009). Certain students were ‘shocked’ at the level of work that was required to produce even a simple game prototype (Estey et al, 2009), suggesting Volk’s assumption that students can easily transition from player to creator is potentially risky.

A further issue relative to student perceptions is the design role. Bayliss and Bierre (2008), when surveying students enrolled in a GDE course, found 25% of respondents chose designer as preferred role. They also noted that was unclear whether students understood what the design role actually entailed. Skrzyszewski et al (2010, p. 253) report 45% of their students chose designer as a preferred game development role. The term game designer can be used as a catchall term for game development and student perceptions of the role may be misguided.

Despite the inherently technical focus characteristic of game development at the coal face, game development is largely perceived as a creative medium rather than a logical and technical one (Taylor and Baskett, 2009, p. 24:3). There appears to be a consensus within education on the importance of creativity in GDE programs: Aoki et al (2005, p. 1) and Taylor and Baskett (2009, p. 24:3) cite the need to balance technical proficiency and artistic creativity when developing a GDE–themed program, while Ip and Capey (2008, p. 21:4) express concern at the lack of creativity shown by their student cohort, noting a prevalence of themes, mechanics and ideas lifted from popular games of the period. Presenting an ostensibly idealised notion of a GDE graduate, Guimaraes and Murray (2008, p. 45) seek to produce graduates who are well rounded creatively and are suited to assuming lead roles in game development studios.
These views are consistent with some examples of industry comment; findings from a 2010 survey of industry shows 89% of respondents consider creativity preferable to communication or organisational skills (Skrzyszewski et al 2010, p. 255). However, as shown previously in this chapter, the majority of industry comment focuses on soft and technical skills, muddying the question of the value of creativity (and therefore time spent developing skills that are not directly linked to a core skill) to industry. Again, a question of balance arises, specifically of pedagogical goals and producing graduates who are industry standard. The theme of the need for balance is a recurring one in GDE literature. That theme is extended into the following section, which balances the previous focus of GDE-specific literature with a review of pedagogical literature from a GDE perspective.

2.5 Pedagogical GDE Theory

Tertiary learning environments generally adopt a mixed pedagogical style of two epistemologies: behaviourism and constructivism (Russell, 2002). Behaviourism is considered a more traditional approach to teaching; i.e. the ‘teacher’ controls the dissemination of information to students (Skinner, 1974). Behaviourist teaching methods are commonly referred to as ‘skill and drill’ or ‘drill and practice’ (Gance, 2002) and provides the repetition required to effectively reinforce response patterns (Skinner, 1974). Behaviourist educational models are generally referred to as ‘teacher-centred’ (Skinner, 1984).

Constructivism is a style of learning that involves the learner constructing and adding to their own existing knowledge through interaction with their environment (Piaget, 1973). Constructivist approaches tend to feature collaborative elements that allow the learner to better grasp and assimilate concepts as part of a collective. Constructivist educational models, as opposed to the teacher-centred nature of behaviourist models, are generally referred to as ‘student centred’, which redirects the focus from the teacher to the student (Barraket, 2005).

Constructivism has largely overtaken behaviourism as a practical educational theory (Tinkler, 1996) (Thompson, 2000). Behaviourism has remained relevant in several disciplines however, notably computer science (Ben-Ari, 1998). Each approach
naturally has perceived advantages and drawbacks; their respective suitability as a theoretical base for teaching game design to tertiary students warrants exploration. This portion of the review will be limited to the application of constructivist and behaviourist theory in a tertiary environment where possible.

2.5.1 Behaviourism and Skill Acquisition

Behaviourism, as the name implies, focuses on the modeling of behaviours exhibited by a student or learner. Behaviourism promotes a form of conditioning; learners are exposed to stimuli which provoke a response. Given adequate exposure to these stimuli over a period of time and the response becomes a conditioned response (Naik, 1998). Skinner introduced the concept of positive and negative reinforcement, defined as ‘operant conditioning’. This type of conditioning is common in schools; allegedly poor behaviour by a student in a classroom results in punishment by the teacher in the hope that the student will not repeat such behaviour (Naik, 1998).

When compared to constructivism, behaviourism can certainly appear archaic; the positive or negative reinforcement from a teacher who controls the distribution of information to students in a very structured, arguably limiting, environment versus constructivism’s collaboration, freedom to experiment and the redefined role of a teacher as a guide rather than an instructor (Russell, 2002). Despite this common perception, behaviourism has advantages that constructivism does not, particularly regarding computer science education to which game design and development will always be linked.

Computer science education features numerous disciplines which, in terms of teaching, requires the student to apply the drill and practice method. A notable example would be computer programming, a skill with measurable competency. Programming is possibly the most notable computer science discipline; certainly, the individual skill most relevant to game design and development and a discipline that readily lends itself to a behaviourist approach. It is procedural in practice and is best acquired through clear instruction and repetition (Ben-Ari, 2004). In the formative stages of a student’s experience with programming, a behaviourist approach arguably provides the necessary structure that might be further developed in a constructivist environment. Additionally,
the need for process and structure in game design and development may be met by applying behaviourist principles to the learning of the core skills a graduate should ideally possess.

Behaviourism is ineffective as an adequate educational framework where collaboration and problem solving are concerned due to its restrictive nature, lack of consideration for the unique individual and that individual’s ability to think laterally when presented with a problem; behaviourists have referred to the mind of a learner as a ‘black box’ (Pizzurro, 1998). Given that game design and development is heavily reliant on a collaborative approach, behaviourism might be inappropriate; however, given the skills that are required to effectively contribute to the game design and development process at a higher than rudimentary level, behaviourism might contribute to the shaping of these skills to the required standard.

The shortcomings of behaviourism as an applied teaching method have been well documented; the apparent lack of focus on the individual and their thought processes, the over-emphasis on observable behaviour and quantifiable outcomes and the lack of motivation in the learner in particular have all received attention as issues of concern (Pizzurro, 1998). Combining a behaviourist method of skill acquisition within a constructivist environment in which to apply these skills may alleviate these concerns, provided the content produced by students in such an environment is assessable as opposed to direct examination of the individual skills used by students to produce this content (Freedman, 1998). The issue of motivation could also potentially be avoided given that the student’s reward for reaching an adequate level of proficiency in a particular skill (e.g. programming or 3D modeling) is the opportunity to apply this skill in a ‘real world’ environment rather than just direct assessment such as an exam (Freedman, 1998).

2.5.2 Constructivism and the Collaborative Environment

The second key educational theory relevant to game design and development is constructivism. Constructivism differs from behaviourism in numerous ways, not the least of which is the focus on the learner as an active, cognitive participant in the learning process and his/her construction of a personal knowledge framework or
schema; these contrast sharply with behaviourism’s rigid structure and focus on quantifiable outcomes.

Constructivism, philosophically at least, has largely overtaken behaviourism as the preferred educational theory where teaching is concerned (Wan, 2006). Constructivism is difficult to implement at the macro level as when collaborating to achieve a common goal, the ability of group members to communicate effectively is impaired if the group is too large. It is simpler for a group of ten students to discuss different approaches or strategies in the interest of reaching a solution than it is for a group of one hundred. Constructivism is therefore generally limited to learning environments of a smaller scale such as individual classes or units rather than an entire faculty or school.

Gagnon and Collay identify four epistemological assumptions concerning constructivism:

1. “Knowledge is physically constructed by learners who are involved in active learning”;
2. “Knowledge is symbolically constructed by learners who are making their own representations of action”;
3. “Knowledge is socially constructed by learners who convey their meaning making to others”;
4. “Knowledge is theoretically constructed by learners who try to explain things they don't completely understand”.

(Gagnon, Collay 1997 pp. 1,)

Knowledge is physically constructed by learners who are involved in active learning.

A learner is placed in an environment and actively explores this environment in order to add to their existing knowledge framework and is guided but not explicitly informed. Given exposure to a new piece of information or heretofore un-encountered concept that conflicts with the learner’s existing mode of thought, the learner experiences disequilibrium (Sarirete et al., 2009). An attempt is made to assimilate this freshly acquired knowledge into the learner’s existing framework and thus restore equilibrium.
Should the learner be unable to assimilate this new concept or knowledge, the existing framework is restructured to accommodate the new information (Sarirete et al., 2009).

**Knowledge is symbolically constructed by learners who are making their own representations of action.**

Each learner assimilates new information in an entirely unique way. For example, a student assimilates and subsequently understands a new piece of information such as a few simple sign language gestures perhaps. A second student might learn these same gestures, however the representation each learner makes of these actions is their own. This highlights constructivism’s acknowledgement of the individual; rather than mere regurgitation of existing ideas or information, a new understanding is developed which the learner can then express as their own.

**Knowledge is socially constructed by learners who convey their meaning making to others.**

The link between social development and the learning process is a key element of the constructivist model. Communication with peers (and instructors or teachers) aids in confirming the learner’s place among his/her peers through the knowledge that is being shared. A learner not only gains an increased understanding of the new knowledge through discussion and communication, but also shares meaning with peers and can apply this understanding through creation. This is an example of Papert’s constructionism, which focuses squarely on the construction of a device, program or other piece produced as a result of a learner’s immersion in a constructivist environment (Papert, n.d.). This concept is related to constructivism and partially related to concepts explored by Piaget (Gance, 2002).

**Knowledge is theoretically constructed by learners who try to explain things they don't completely understand.**

By verbalising new knowledge or a new concept without fully understanding it, learners can construct a rudimentary or theoretical framework of that new knowledge or concept that is strengthened through their attempts to communicate their understanding to their peers. To summarise, knowledge is constructed physically, symbolically, socially and theoretically.
Gance (2002) highlights two key aspects of the constructivist environment. Constructivist pedagogy features an interaction with the learning environment itself and this interaction can be considered dialogic; the learner participates in a dialogue with the environment and with other participants. A games design related example might be to have students attempt to design and implement a game rather than merely expose them to game design and development concepts in a more behaviourist manner. The students therefore learn real-world strategies to cope with the constraints of the design environment (Gance, 2002).

Another key feature of constructivist pedagogy is a real world or authentic problem solving task. The learner is placed into a context in which information to be learned or skills to be applied make sense, rather than being an abstract demonstration of a particular skill. Given the imposition of real world relevance, constraints would apply, such as limited resources, limited availability of certain tools or certain design constraints depending on the task or goal (Gance, 2002).

A constructivist teaching model thus requires two distinct elements; learners who are able and prepared to learn cognitively, and an environment in which this learning can take place effectively. The role of teacher or, more appropriately, guide, is ancillary to the learning environment (although he or she plays the role of a learner also; social construction is particularly relevant here).

Since game design and development requires practitioners of varying disciplines to contribute to a development project, it is an inherently collaborative process (Burns, 2008, p. 154). Exponents of different game design and development disciplines must collaborate and communicate ideas and features to fellow team members who themselves practice a completely different discipline (i.e. concept art and programming). This suggests that any game design and development educational model feature constructivist and collaborative elements. The link between collaboration and constructivism is supported by most constructivist educational models and is considered an important element in the constructivist learning process.

It would seem that given the not uncommon reliance on technology prevalent in game design and development (particularly regarding the core skills such as programming), research on the supposedly constructivist nature of technology in a
pedagogical context indicates that the process of learning core skills via technology could also be taught within a constructivist environment. Nanjappa and Grant (2003) suggest that the introduction of technology to learning environments reduces or at least alters the role of the teacher from instructor to facilitator. The learner is empowered through technology; tasks are made more dynamic and new learning opportunities are created through the use of technology (generally a computer) (Nanjappa and Grant, 2003). This argument is, however, potentially flawed; Gance (2002) cautions that to claim technology as inherently constructivist is to spare such an approach from thorough critical analysis and that despite well intentioned attempts to introduce such an approach, often the outcomes labeled constructivist were largely behaviourist in nature (Gance, 2002).

Striking a balance between skill acquisition and relevant application or behaviourism and constructivism is supportive of the aims of this study. Behaviourism may not provide adequate opportunity for stimulating and rewarding application of acquired skills relevant to game design and development, but combined with a constructivist learning environment in which to apply these skills, students may be better prepared as game developers while improving essential communication and collaborations skills.

2.5.3 Game Development in a Tertiary Environment

Behaviourism has long been the adopted epistemology of computer science education (Ben-Ari, 1998). As previously stated, a behaviourist teaching model would appear to be an appropriate method to impart information to students where computer science is concerned; programming for example is a skill best acquired through repetition or ‘skill and drill’. The creative process of game design and development is inherently constructivist in nature; practitioners of diverse disciplines must collaborate and communicate to achieve a successful commercial outcome. Constructivism has been partially utilised in CSE (computer science education) environments but generally in limited application (Hadjerrouit, 2005).

Given that game design and development is largely a hands-on collaborative process and yet draws from numerous disciplines both outside the scope of computer
science (e.g. visual design) and within it (e.g. programming) (Burns, 2008, p. 154), a blend of behaviourism and constructivism would seem an ideal approach when considering the most appropriate methods when teaching undergraduate students. It can be argued that a game design and development curriculum derived from a computer science curriculum should feature units common to any computer science curriculum (i.e. computer networks) in order to provide adequate versatility; however, that is beyond the scope of this review.

Given that game development occurs in a collaborative studio environment, it seems appropriate to simulate that environment in a tertiary education setting. Blashki (2000) discusses the use of a studio environment as part of a multimedia curriculum. Blashki’s studio is student centred rather than teacher centred and features elements common to an industrial studio environment: work stations to accommodate group work, a board room table where students can discuss concepts as a larger group and individual work stations for, unsurprisingly, individual creative work (Blashki, 2000). This environment would facilitate the practical application of skills in a ‘near enough to real-world’ context and is highly applicable to the games design and development process.

The following case studies document game design and development projects conducted in educational institutions featuring collaboration between students, often in a studio environment.

2.5.4 GDE Case Studies

The following case studies detail the game development process in an educational environment. Of interest are the underlying pedagogical approaches.

Case study 1: Mermaids

Pearce and Ashmore documented the development process of a student created massively multiplayer game entitled Mermaids, specifically created by the emergent game group (EGG) at the Georgia Institute of Technology, Atlanta, Georgia (Pearce and Ashmore, 2007). The group’s research mission was to develop games, techniques and design features that would promote and facilitate emergent social behaviour (Pearce
and Ashmore, 2007). Of interest were the methods adopted to guide the students through the development process. Pearce and Ashmore describe the proposed gameplay in Mermaids as constructivist; the methods employed to guide the students during the creation of Mermaids could also be termed constructivist. One of the key methods of Mermaid’s development process was the use of a project studio, similar to that outlined by Blashki (2000). This allowed students to simulate a game development environment more akin to that of industry and facilitated a collaborative work culture over the course of the two year project (Pearce and Ashmore, 2007).

The design process for Mermaids is described by Pearce and Ashmore as highly collaborative, consistent with a constructivist attitude. The aim of the studio as described by the authors is to allow students either as part of coursework or on a voluntary basis to have a hands-on creative role in the creation of a game. No mention is made of the benefit gained by students working under these conditions beyond a useful addition to a portfolio or similar, however as Gagnon and Collay argue, this type of environment promotes the practical, social, symbolic and theoretical construction of knowledge and equips students with the standard of communication skills required of developers in industry (Gagnon and Collay, 2000).

Since the contributions made to the project by students were largely voluntary, no reference is made to the methods by which the students acquired the skills that allowed them to contribute adequately to the project. It can be reasonably assumed that a more traditional, behaviourist approach was used given the commonality of that approach in computer science. This paper covered only the initial design stages of the project and as such offered no real indication of success or failure.

Case study 2: That Cloud Game

Fullerton, Chen, Santiago, Nelson, Diamante, Meyers, Song and DeWeese (2006) adopted a similar approach to teaching game design albeit on a smaller scale and in a more structured fashion. Students at Columbia University enrolled in a video game technology course based on three key tenets:

1. Students were to be provided with a solid foundation in both technical and design concepts, Fullerton et al’s argument being that good designers must understand technology and good technologists must understand design
(Fullerton et al., 2006), an apt sentiment considering the broad range of skills possessed by game developers.

2. Game design and development is a collaborative process in virtually all cases, so students should work in groups in order to mimic industry practice.

3. Game design development involves good design, clever use of technology, collaboration and commercial viability; the last element alludes to the real world relevance typical of projects developed in a constructivist environment (Fullerton et al., 2006).

These tenets can be termed constructivist in nature; first, solid grounding in both technical and design skills allows for improved communication and understanding between disciplines which leads to; second, collaboration, where good communication is vital and which exposition of practitioners of one discipline to the basic skills of the other can only enhance, and; third, as mentioned, alludes to constructivism’s constant relating of activities to the ‘real world’.

Two of the course’s designers were originally from industry so could provide relevant industry experience. This experience provided a number of insights, one of which was to provide industry context and thus increase student motivation. As part of the curriculum, lectures were included on topics such as the history of the games industry and the industry’s financial structure. In addition, guest lecturers from industry were invited to take part when topics of a more practical nature were covered. Efforts were made to mimic industry practice in a practical sense, i.e. design reviews (Fullerton et al., 2006). Lectures conducted on game design and development concepts covered such areas as AI, animation, physics, graphics programming and so on (Fullerton et al., 2006).

The main focus of the paper is on students projects and the methods used to structure these projects. Students were allocated to groups of between four and six and were required to decide the type of game they would like to design and develop. Requirements consisted of pitch documents, design documents and a technical proof of concept lending further weight to the industry context. Milestones were set and exams were replaced with preliminary design documents, eschewing the behaviourist model in
favour of a more progressive constructivist approach. Lecturers acted as mock publishers to which the students had to ‘sell’ their concepts, at turns critical and enthusiastically collaborative (Fullerton et al., 2006).

Skill acquisition was problematic; given time constraints, splitting the two distinct paths in game design and development (art/design and programming/technology) was not feasible, so each stream focused on one area. This contradicts the desire to provide students with a rounded perspective on all areas of development; ideally students from both disciplines would sample the other in subsequent semesters. Design students would be provided with a ‘technology-lite’ syllabus and vice versa (Fullerton et al., 2006). There is no suggestion of how these syllabi might be structured from a theoretical viewpoint.

Fullerton et al (2006) mention that several students who participated in the course have subsequently been employed by industry. Whilst this is a quantifiable measure of the success of a course, no doubt the strong link between industry and university established at the outset assisted enormously in establishing graduates as capable and employable. What is less quantifiable but perhaps of great significance is a consideration of the methods used to structure the course. Clearly, a constructivist approach has played a major part in the success of this course; the collaboration between students, the freedom of students to tackle problems in their own manner and thus build knowledge theoretically, socially, practically and symbolically, the lecturer’s role as facilitator and even collaborator and the relevance to industry are all hallmarks of the constructivist approach.

Despite limiting the scope of this study to Australia, the lack of case studies documenting educational game design and development experiences in Australia requires that any available case study be used regardless of origin. Unfortunately, case studies from outside Australia documenting any sort of game design and development experience are apparently scarce. A set of guidelines for creating a game design and development degree have been created by the IGDA (International Game Developers Association) but is still in the beta stage and has not been updated since its second iteration in 2008 (IGDA, 2008). It features a series of topics such as Games and Society and Games Programming, but based on the attached case studies seems suited
to adding components to an existing computer science degree rather than building a dedicated game design and development degree from the ground up (IGDA, 2008).

2.5.5 Pedagogical Discussion Summary

The inception of the game design and development industry, when compared to other similar industries such as film and as an extension of the software development industry, is relatively recent (Nerve, 2008). Game design and development as a viable basis for a university, college or TAFE curriculum is also, unsurprisingly, a relatively recent concept. The industry itself lacks a consistent framework or process that can be reliably adhered to, thus it is difficult to design a curriculum to complement it. The suggested curriculum framework from IGDA is still a work in progress (IGDA, 2008), though the fluidity of game development as a discipline limits the usefulness of a permanent or finalised framework.

As indicated in part by the above case studies, adopting a behaviourist approach will allow students to acquire and develop necessary skills required by the game development industry. Combining this approach with a constructivist framework that allow students to familiarise themselves with a collaborative environment provides a rounded development environment. Within this environment, students will have the opportunity to practice their particular discipline in a ‘real world’ setting and collaborate with fellow students, thus simulating the studio environment of a game development company. This combined approach or framework can bridge the gap between industry and education at the theoretical level (Gagnon and Collay, 2000), while direct and frequent input from industry can provide guidance when installing the practical elements into such a framework (Fullerton et al., 2006) (Sturtevant et al., 2008) (Claypool and Claypool, 2005).

This exploration of educational theory is ultimately supplementary to review of literature that documents existing GDE programs, industry opinion, issues with GDE as highlighted by authors and educator experiences within GDE programs as a basis for this study. While the study is primarily focused on practical outcomes rather than theoretical, the pedagogical foundations for GDE are yet to be clearly defined. An opportunity exists to develop a sophisticated theoretical model on which to base GDE
program development, incorporating some of the above literature (and other related literature, such as normative theory to guide ideal pedagogical approaches) and drawing from disciplines other than those directly related to game development.

2.6 Chapter Summary

This chapter explores the existing GDE literature in order to identify the gaps in current understanding of GDE, particularly in the Australian context. While Australian-specific GDE literature is lacking (and GDE literature overall is relatively uncommon), the existing literature offers several distinct areas of focus. Industry’s dissatisfaction with GDE programs is evident, particularly in the UK as highlighted by Ip (2012) (Ip and Capey, 2008). McGill (2009) neatly summarises the expectation gap between industry and education. Dalitz (2011) provides some coverage of Australian game development training programs and offers a small sample of industry opinion on GDE. Haukka (2011) offers a broader view, in particular via a poll in which 84% of respondents declared GDE courses unsatisfactory.

Interdisciplinary collaboration emerges as a key topic, employed by numerous authors at varying levels of complexity (at the organisational (Kessler et al., 2009) and practical level) and with varying degrees of success. The value of interdisciplinary collaboration to industry is evident given industry feedback (Parberry et al., 2005) (Sturtevant et al., 2008), though whether this approach is of equal value in the Australian context is unclear. Game development skills sets are explored by several authors in various contexts, including CSE based course content (Parberry et al., 2011) and general industry requirements analysis (McGill, 2008).

Contradictions about which skills are of value to industry arise from analysis of industry comment; some feedback suggests a rounded game development graduate with no specific skill-set is preferable (Dalitz et al., 2011, p. 33), while alternative feedback prioritises core skills over knowledge of the development process and pipeline (McGill, 2009, p. 135). The gap in understanding about which skills and educational background are preferred by industry is still evident, particularly in the Australian context. Aside from graduate skills, while the issue of student perceptions is not research-critical, it is nevertheless relevant to this discussion given students role as a stakeholder.
As a supplement to the GDE-specific literature, pedagogical literature was explored in a GDE context in order to provide an expanded discussion about the theoretical underpinnings of GDE. The role of constructivist and behaviourist principles as a means of guiding the underlying structure of GDE was explored through analysis of work by Piaget, Skinner, Gagnon and Collay and other theorists. While not crucial to the immediate aims of this research, this portion of the review served to explore which pedagogical approaches were best suited to GDE. A mix of constructivist (for application of skills in an interdisciplinary and collaborative development environment) and behaviourist principles (for acquisition of skills such as programming) seems a suitable foundation for GDE according to literature.

This research seeks to explore the Australian industry view on GDE. Existing literature suggests that industry’s perception of GDE will likely be negative, but the underlying causes of that perception are unclear. It is also unclear as to whether Australian industry would prefer graduates from a GDE-specific background or a more traditional (for instance computer science or fine art) background, nor the particular suite of skills they seek in a candidate (though a number of technical and soft skills highlighted by several authors provides some indication as to likely responses). These gaps are broad enough that an equally broad range of research participants, data collection and data analysis methods are required to adequately explore the local games industry view. With that in mind, the following chapter outlines the research design for this thesis. It includes the author’s epistemological stance, chosen research methodology and the tools used to gather the data required to adequately address the stated research questions that arose from the gaps identified within this review.
CHAPTER THREE

Research Design

3.1 Introduction

This chapter presents the methodological issues faced during the formation of the following research design and how they were addressed during its conception and application. This chapter details the process of determining:

- the type of research that was to be conducted;
- the researcher’s epistemological and ontological stance;
- which methodology best suited the research questions;
- the research methods that would be most appropriate for gathering and analysing the necessary data; and
- describing the application of those methods.

The methodology, research methods and data collection tools are detailed later in the chapter, but before presenting those aspects of the research design, the epistemological and ontological stance of the researcher must be established. This then informs the rest of the research design and ensures a philosophical and thematic consistency. This chapter examines the methods used to gather, analyse and present data collected in order to address questions about the state of GDE in Australia and the relationship between the Australian games industry and Australian tertiary institutions. It will explain how these methods were chosen and why, who the participants were, how and why they were chosen, the type of data that was collected from those participants and the analytical methods used to process the data.

3.2 Research Type

Miles and Huberman (1994) define three categories of research; descriptive, explanatory and exploratory. The type of research conducted here is deemed to be exploratory because the issues that are being investigated (specifically the perceptions
of GDE from an industry perspective) are not clearly defined. This research is not utilising data derived from a known and understood set of phenomena. Rather, this research aims to identify what the issues are, based on industry’s perspective of GDE, where those issues occur, why they occur and, ideally, how they might be addressed. Broadly, the aim of this research design is to gather knowledge about industry’s perspective on GDE. How this knowledge is gained and how these aims are met depends largely on the researcher’s epistemological stance.

3.3 Epistemology

The process of choosing or identifying where a researcher stands on the acquisition of knowledge is a largely introspective one and this stance is developed irrespective of the research currently being conducted. Chapter 2: Literature Review, suggests constructivism as an appropriate epistemology where the teaching of GDE is concerned and a constructivist view applies to this researcher’s broader epistemological stance. The constructivist assertion that knowledge is assimilated into existing knowledge structures (Piaget) as opposed to the black box of behaviourism (Skinner) is a foundational tenet of this research. The Australian games industry is far from uniform either in terms of process or scale (as mentioned, this is problematic for educators when identifying a model for GDE) and in order to build an understanding of how the games industry and games education fit together, a flexible approach is required.

3.4 Ontology

The focus of this research is specifically on the industry perspective of GDE, but the broader focus is on social interaction between two distinct groups and the characteristics of this interaction. Ontologically speaking, this lends itself to an interpretivist or post-positivist mindset (Stahl, 2007). The needs and aims of each group fluctuate over time; for instance, the total number of functioning Australian games studios has diminished in the past five years, so where once a need for new development talent was paramount, there now arguably exists a gulf between the number of students seeking employment and the number of available positions (Pink, 2013). In order to adequately ascertain how educators and industry can best meet the
needs of the other at a given time, interpretation of how these needs are expressed is important. Clear articulation of views that explore how educators can assist developers (and vice versa) is dependent on who is expressing those views, how they express them, who they express them to and the respective agendas of each party. Attempts to gather empirical data that illuminates the nature of these interactions and how they might be improved would seem difficult if not impossible.

The exploratory nature of this research dictates that both qualitative and quantitative data be considered as valid sources (Morse and Niehaus, 2009). This chapter will present the process that lead to the adoption of a mixed methods approach and justify the use of qualitative data as the primary data type. Philosophical debates on the validity of qualitative data and the issues inherent in combining quantitative and qualitative data are common (Sale et al., 2002), but coverage of that ongoing discussion is not merited here. Suffice to say that the common pitfalls and drawbacks associated with qualitative data collection and mixed methods approaches are acknowledged but considered inessential to the following explanation of the adopted methods for this research.

3.5 Research Purpose and Justification

The purpose of this research is initially to explore the state of Australian GDE as perceived by the Australian games industry, provide a detailed assessment of the issues identified by industry and offer possible solutions to these issues. This encompasses analysis of the relationship between education and industry, chiefly through seeking industry perspective on GDE. The validity of this research is supported by concerns raised about the quality of GDE both globally (Humphries, 2008) (Chapman, 2008) (EDGE, 2013) (Swan, 2008) and locally (Haukka, 2011) (Dalitz et al., 2011). This research arose from a need to develop a greater understanding of industry’s view of GDE on a partially theoretical but largely practical basis and. It was also influenced by a desire to improve the standard of GDE graduate skills and increase the validity and utility of GDE programs.
3.6 Research Questions

While these questions are partly derived from review of literature, they are also extensions of questions raised in an honours thesis completed by the author prior to commencement of this study (Bowtell, 2008). This honours thesis dealt with similar themes and questions, albeit on a smaller scale and with a far smaller data set. This current study combines those initial steps with a more robust review of literature to develop a more incisive set of questions. The specific research questions are as follows:

1. **How are Australian game development courses perceived by the Australian games industry and why?**
2. **What is the preferred educational background of the average Australian game development graduate seeking a game development career?**
3. **How can Australian game development courses service the needs of industry in the future?**

The contribution made by this research to the existing body of knowledge is to provide an exploratory analysis of the problems inherent in GDE as viewed by industry, offer possible solutions to these problems and to engage in discussion about the theoretical basis for game development as education.

3.7 Choosing a Methodology

Research questions should inform the methods used to answer those questions. One particularly definitive aspect of this research became clear in the early stages; the relative lack of literature (and the rather anecdotal nature of much of the existing contributions (Sturtevant et al., 2008)), particularly of Australian origin, dictated that this research would be largely exploratory and require input from several stakeholders to properly identify the key issues.

The process of developing new knowledge about a subject, the problems related to which are unclear, is deemed an inductive process (Morse and Niehaus, 2009). This inductive theoretical drive typically points to qualitative data collection methods in a
single method or study, as opposed to quantitative methods as would be matched with a
deductive theoretical drive (Morse and Niehaus, 2009). Qualitative data is the primary
data source from which this research will derive its outcomes. However, qualitative
data and analysis methods alone would not provide a set of data rich enough to answer
the range of questions that arose from preliminary research. Some form of quantitative
data would be required to supplement the core data set. Since qualitative and
quantitative methods are traditionally at odds (Sale et al., 2002), establishing a suitable
way of linking the two became paramount. Not only would each type of data have to be
interwoven to properly address the research questions, it would require a framework in
which this approach could be neatly situated, if only for the sake of clarity.

One possible method which can accommodate both qualitative and quantitative
data is the case study. Utilising this method would address the issue of how to combine
the two disparate types of data in a meaningful manner. A case study allows for a
number of differing research methods to be utilised, is suited to exploratory research
and is also suited to research that relies heavily on qualitative data (Gillham, 2000).
Ideally, using a case study method and mixed data collection techniques, convergence
between those disparate data will occur and solidify the suppositions held about the
topic. Given the issues being explored are of reasonable complexity and scope, the
freedom a case study provides allows data from disparate methods of data acquisition to
be added to the flow of information, with a view to compare, synthesise and contrast
each piece of data until a clear and concise summary of the Australian game
development scene is actualised.

However, upon further investigation of this possible framework (and the state of
play in the local games industry), it was determined to be less than ideal. The manner
in which a case study is typically conducted was not suitable to the research were it to
be utilised in a more traditional manner; game development studios vary too widely in
size, scope, output and resources for a single case to be reliably representative and
reflective of the broader industry. Subsequently, generalizability of results is also an
issue. Much the same could be said of GDE courses; some are built from the ground
up, some are extensions of CSE courses and others branch from traditional art or
interactive media curricula (Parberry et al., 2005).
Another early proposal consisted of establishing the story of each stakeholder (student, educator, developer) as its own case, effectively treating the research project as one large case study. This offered several advantages, most notably a means of organising and linking each stakeholder’s narrative in a potentially concise and logical manner and also providing an established means of linking the qualitative and quantitative data. Using the case study as a linking device or shell, within which the relationships between the stakeholders as represented by the differing data could be managed, seemed to be a viable method of conducting the research. On reflection, this approach proved to be too unwieldy and too complex once the focus shifted to a largely industry perspective.

It became apparent that it was not necessary to adopt an ‘overshell’ device that could accommodate the various tools and methods used to collect and analyse the data; the research questions themselves would adequately frame the results and dictate the manner in which they were combined. A research design should typically flow from the research questions (Marshall and Rossman, 2010). The complexity of this combination of stakeholders, questions, data types and methods could be better combined using a simpler, more straightforward guiding methodology.

3.8 Mixed Methods Approach

Once it had been established that an overly complex means of framing the data was not required, the mixed methods approach became the most obvious fit for this research design. It offers a means to combine qualitative and quantitative data in varying ways depending on the kind of research (Morse and Niehaus, 2009) being conducted. It also provides the means to interweave the results of each data collection phase into a clear narrative driven by either qualitative or quantitative techniques.

Morse and Niehaus (2009) identify the importance of theoretical drive in a mixed methods research design. The theoretical drive of a research project dictates the manner in which the research should be conducted and informs the research design regarding appropriate data collections tools, techniques and focus. As noted, informed by the research questions, this research is largely exploratory. As such, the theoretical drive for this research is inductive rather than deductive, meaning the primary means of
data collection and analysis should, as previously noted, consist of qualitative methods; these methods should guide the manner in which the research progresses from this point. In this case, quantitative data and any accompanying analysis acts as a supplement to the core qualitative data, supporting the themes derived from content analysis and coding of said data. This approach can be summarised as QUAL + quan (Morse and Niehaus, 2009). While qualitative methods as utilised in this research design are deemed to be dominant, the QUAL + quan approach indicates the inclusion of quantitative methods at the initial design stage, rather than their inclusion being determined following a revision of the chosen approach.

From the outset, the importance of providing a complete industry perspective was established. The broad overview that senior developers and studio heads could offer was determined to be best exploited through face to face interviews, allowing themes to emerge and to be explored. This alone would prove revealing, but in order to provide a complete impression of industry’s view on GDE, first-hand accounts of individual experience of tertiary education from less senior developers was identified as a necessary inclusion.

A mixed methods approach features a point of interface, or the point at which the disparate data collection methods overlap (Morse and Niehaus, 2009). The point of interface can differ depending on how a research design is structured. A quantitative approach included after re-evaluation of the validity of a solely qualitative approach (following a preliminary study for example) would establish the point of interface as within the boundaries of results and discussion. However, the use of both quantitative and qualitative methods was determined at the outset, so the point of interface is the research design stage.

It is important to note where the point of interface occurs, as the origins of the relationship between the qualitative and quantitative methods impacts upon how the results and discussion are shaped. In this case, links between the two approaches were identified at the research design phase (following a preliminary study) and the interview questions and survey questions were designed concurrently. This approach provides a link between the interview and survey results before the main data collection phase began and ensured a thematic consistency from the outset. Once the data are acquired and analysed, the qualitative data forms the overarching narrative (largely concerned
with the relationship between industry and education) and is supported at intervals by the quantitative data.

By way of justification for and as a short afterword on this chosen methodology, one of the key issues highlighted in the introduction and literature review was the relative dearth of literature on the topic of GDE. This lack of coverage warns against a purely qualitative or quantitative approach. Quantitative data alone would not adequately reveal the issues concerning both industry and education if they are in fact completely known by educators and senior developers. A key aim of this research is to reveal the problems with GDE from an industry perspective, an aim best achieved through qualitative means. However, qualitative methods alone would not accurately depict the problems clearly either.

A typical tool of qualitative researchers is the interview (Morse and Niehaus, 2009) and this tool would be utilised as part of this research design (see Section 3.9). While problems as identified by industry interviewees can be explored through discussion and subsequent analysis, the varying size and type of studios, tertiary institutions and available courses and fluctuating state of the Australian industry (Pink, 2013) render the possibility of producing generalisable outcomes from those interviews alone somewhat precarious at this stage. Of concern is the possibly subjective nature of the results. It is in this case that a quantitative data set, in support of the qualitative data, becomes prominent.

If, hypothetically, findings from the developer survey suggest that the vast majority of gainfully employed developers have not graduated from games courses, that would seem to be a clear indication that graduates of such courses are for some reason less successful at gaining employment in the games industry than graduates of other more generic courses. If qualitative analysis reveals why developers do not favour games course graduates, a firm link can be established between the two, thus leading to a stronger conclusion than if only one means of data collection and analysis or the other were present.

Where this research extends upon existing GDE research is the focus on qualitative data. The majority of GDE studies to date have utilised quantitative methods, typically via industry surveys (Skrzyszewski et al., 2010) or quantitative
analysis of skill requirements (McGill, 2009) (though a 2012 study by McGill utilises both qualitative and quantitative methods of data collection and analysis). Through collection and analysis of interview data from industry participants, a more complete analysis of the problems faced by GDE can be conducted.

3.8.1 Research Phases

The three phases of this research referred to in Chapter 1: Introduction are clarified here. The first phase was an informal preliminary study conducted in 2009 that involved three participants: a senior academic, a senior developer and a government representative involved with game development. This study was partly influenced by an honours (fourth year) research project conducted in 2008 (Bowtell, 2008). Interviews were conducted with each participant. The aim of this preliminary study was to ask the participants about game development and game development education in Australia. This was conducted with a view to designing a more focused set of research, interview and survey questions for the primary study.

The informal nature of the preliminary study and the role that it played in assisting development of the primary study means none of the collected data from this preliminary study is presented in this thesis. However, it is important to describe the role that it plays in this research project. The second phase was the literature review, the use of which is rather self-explanatory. The third phase, the collection of data from interview and survey respondents, is described at length in this chapter. Figure 3.1 illustrates the relationship between these research phases.
3.9 Survey and Interview Design

This section details the design and creation of the surveys and interviews used to gather the required data. Each question is addressed through analysis of both survey and interview data. The design of both the surveys and the interviews were influenced primarily by the research questions. For instance, the second research question (What is the preferred educational background of the average graduate seeking a game development career?) suggests that in order to answer it, data about the educational background of currently employed game developers was required. Questions designed to collect this data were used in the industry survey (see Appendix 1).

Furthermore, the interviews offered an opportunity to inquire about the kind of skillset the studio CEOs sought of graduates and valued in their current employees.
Questions that explored these topics were included in the interview design (see Appendix 3). Finally, the student survey contained questions regarding preferred roles that students would seek if applying for a game development position. Data collected from this portion of the student survey could be contrasted with data about common industry roles in order to better illustrate the expectations of students when contrasted with the realities of the games industry (see Appendix 2).

3.9.1 Survey

Two surveys were designed; a developer survey and a student survey. The developer survey used the following categories:

- Demographics
- Industry experience
- Education
- Skills (qualitative responses)

The developer survey data was largely designed to aid in answering the second and third research questions. The second research question is as follows:

*What is the preferred educational background of the average graduate seeking a game development career?*

This question requires information about respondents’ educational history and skill set, hence the *Education* and *Skills* categories. These categories contain questions such as ‘*Do you have a formal educational qualification?*’, ‘*Did you participate in extra-curricular game development projects during the course?*’ Respondents were asked to offer a reflection on their past experience (specifically about skill competency): ‘*Did any of your skills require improvement once you entered the industry?*’ (see Appendix 1).

Besides this obvious line of questioning, data from the demographic and skills categories also have value when addressing this question. Attached to this question are several considerations that warrant collection of data beyond information about each respondent’s educational or employment history. Inherent in the question is the notion
of graduate presence in industry; an older demographic (on average), for example, might suggest a lack of recent graduates in industry. Respondent location data indicates where the majority of employment opportunities are to be found; this may potentially impact on graduate opportunities. The industry experience category relates to the third question:

**How can Australian game development courses service the needs of industry in the future?**

In order to gauge where the Australian industry is headed (and therefore how education might potentially accommodate it), data about the roles and experience of survey respondents is required to assess the current state of the industry. Questions in this category include’ Have you previously worked at other game development studios?’ and ‘What is your current role?’ This data can be used in combination with the interview data to draw conclusions about how education can prepare graduates for roles in a future incarnation. The student survey is intended to act as a contrast and comparison to the developer survey data and to gauge student engagement levels and understanding relative to the expectations of industry. The student survey used the following categories:

- **Level of understanding**
- **Engagement levels and preferences**
- **Industry knowledge**
- **Satisfaction levels**

The data collected from students is used in answering the first research question. The categories share some similarities with those used in the industry survey; for instance, students are queried about their preferred game development role. The student survey is designed largely to gauge student expectations and is deemed the third most critical of the data sources.
3.9.2 Interview

The interview design was created alongside the surveys in order to ensure consistency. The interview categories include game development education, industry, skills, future and collaboration. The game development education and collaboration themes relate directly to the question of industry perception, the industry and skills categories relate directly to the education question and the future category relates directly to the industry future question. Each category contained questions related to that category but it is important to note that the exact same questions were not necessarily asked of each interviewee as each interview evolved differently to the other, meaning certain questions were answered in the course of answering other questions. The categories acted as a guide to ensure the same broad topics were addressed across each interview despite the differing order and format of questions (see Appendix 3).

3.10 Methods of Analysis

Since the research design is described as mixed method, the data analysis process must reflect that. Coding, content analysis and explanatory tabulation of data is required to cover the acquired qualitative data, while more traditional statistical methods are applied to the quantitative data.

3.10.1 Qualitative Data

In order to coax useful and applicable conclusions from the interview data, identification and derivation of meaningful themes or patterns from the data and the subsequent classification of said themes using a suitable system of categorization (Zhang and Wildemuth, 2009, p. 2) is required. Qualitative content analysis requires a measure of inductive reasoning, which is potentially fraught with risk (Zhang and Wildemuth, 2009) though, as mentioned, the nature of this research is largely exploratory.

Zhang and Wildemuth highlight the need to define the unit of analysis to be drawn from the content being analysed; in this case, the units of analysis are themes
(2009, p. 3). Written responses are analysed in search of common themes; for example, if fifteen participants are interviewed, the majority of those might list teamwork, or the ability to collaborate, as a vital skill that graduates of GDE courses should possess. This can be identified as a consistent theme and classified as discipline-agnostic skill or quality sought by industry. The categorisation or coding process allows the data to be summarised and organised in such a way that conclusions could potentially be drawn from data that might otherwise read as a series of abstract events or observations (Siedel, 1998)

This process is managed in stages. Data is codified during the collection process and general themes or categories are identified, such as positive comments about education from developers (DEV-ED+). As more data is gathered and new codes are devised and applied, data granularity is gradually refined and a more concise, permanent set of codes are revealed. These are then used to identify and withdraw the notable comments, observations and general remarks that relate to the research questions.

This process achieves two outcomes; first, the data is reduced into manageable chunks which can be more readily summarised and analysed and the irrelevant information gathered as part of the interview process can be discarded. Second, the data reduction process allows the data to be displayed in a meaningful manner. In the case of the interview data, many pages of transcribed interview notes are condensed into logical, accessible flows of information that can quickly and efficiently communicate the key findings in a particular context. Furthermore, having reduced and refined the available data to a more meaningful set of information, the data can be verified, validated and concluded from.

3.10.2 Quantitative Data

The collected quantitative data plays a supplementary role in answering the stated research questions. The data, once collected from survey respondents and collated, is summarised using descriptive methods (charts, diagrams, tables). A second level of analysis is applied to draw links between certain groups of data. Inferential statistical analysis is conducted to draw potentially generalisable results from the data. T-tests,
chi square tests, confidence intervals for mean and proportion are applied to demographic data, educational background data and age versus educational qualification. The aim of this process is to provide a low level analysis that aids the formulation of conclusions largely guided by the qualitative data analysis.

3.10.3 Analysis Beyond Theme Identification

According to Bazeley (2009), drawing themes from qualitative data and presenting them as a final outcome is common in qualitative research but is considered to be a valid starting point but ultimately rudimentary. In this research, presentation of themes is the first step of the analytical process. The aim of this process is to link these themes within the context of the relevant research questions, themselves existing within a larger analysis. The objective of this process is to apply a more rigorous analytical process than that offered by theme identification (and presentation) alone and, as such, is intended to enhance the validity of any conclusions (Richards, 2009, p. 149). Bazeley (2009) cautions against reliance on purely descriptive reporting.

The following is a brief summary of the approach used to identify, codify and derive the themes from the qualitative data. These themes would arise as a result of a particular question being asked of respondents, tangentially in the course of discussion or were offered by respondents in the ‘further comments’ section of the industry survey. A coding process (see Chapter 4: Results, Section 4.4.) was applied to mark emergent themes. Once this coding process was complete, comments or replies defined as being thematically linked were collected and aligned. These comments were then distilled to reduce them to the essence of each statement and were tabulated. This process was conducted for each interview transcript and each qualitative response as provided by survey respondents.

The themes derived from the collected data were not fully developed until a comprehensive review of both the qualitative and quantitative was completed. Some of the themes that arose from this analysis, such as how industry perceives education and graduate opportunities within industry were expected as they were explicitly drawn out by the second research question. The perception of GDE as held by industry was in particular expected to be a major discussion point.
3.10.4 Organisation and Presentation of Data

When presenting the collected data in Chapter 5 (Discussion), a hierarchical structure is used. The three forms of data in order of priority are as follows:

- Interview data
- Qualitative survey responses
- Quantitative survey responses

The final interview data has been collected from participants who are CEOs of their respective game development studios. In this capacity, they offer considerable industry experience and a high level view of the Australian games industry. By extension, they offer a view of the place of education within the Australian game development landscape. This data provides the first line of analysis. Secondary to the interview data is the qualitative responses from survey respondents. This data offers insight from typical game developers at a lower level.

The comments contributed by these respondents offer a sample of their personal experiences with education and perceptions of it. This data supports the themes established by the qualitative interview data. Tertiary to the interview data is the quantitative data derived from the developer and student surveys. This data supplements the qualitative data and supports themes derived from the qualitative data as outlined in Chapter 4: Results.

3.11 Participants and Sampling

Representatives of four separate groups were interviewed. The sampling is reflective of the three stakeholders identified earlier (see Chapter 1: Introduction, Figure 1.1), plus a government representative. The four groups are game developers, academics who are involved with game development courses, the aforementioned representatives and students. Only two of these stakeholders feature in the final analysis, those being developers and student; the remaining two were participants in preliminary interviews, designed to inform the final interviews and surveys that would be used in the final analysis presented in this study.
The developer sample is purposive and specifically homogenous, in that all participants are developers, but those who participated in interviews were studio heads or CEOs. The common characteristics sought of this sub-group were largely based on experience and seniority (preferably CEO level or similar). This would ensure they had involvement with recruiting new talent, a clear overview of the industry and education and therefore a reasonably clear understanding of graduate standards of the day. It would also likely ensure that they would have experienced sufficient contact with tertiary institutions, instigated either by themselves or the institution.

Given the largely exploratory and inductive nature of the research, the qualitative data to be collected via interview required the primary sources to be carefully selected. Those chosen to participate in the online developer survey (Appendix 1) were homogenous in that each were game developers of some description, but beyond that, age, experience, or role were not considered limiting factors for eligibility.

The homogeneity of the academic sample is not in question given that only one academic was interviewed during the preliminary study. Regardless, the interviewee in this case is involved with the running of a tertiary level GDE course. The characteristics required of this sample were largely based around this requirement, though it is also required that they have adequate experience in the role (at least enough to confidently comment on the state of play as they perceived it). The government representative was involved with higher level industry concerns, such as funding and was sought in order to provide an overview of possible industry issues.

Finally, students were chosen to participate in an online survey (Appendix 2). The student participant group feature arguably the least variance and, in terms of research outcomes, were the least outcome-critical of the stakeholders. Students are a key element of this research, but do not factor in how the research outcomes are reached. Students were selected randomly, the limiting characteristics were that they be enrolled in some form of game unit or course and attend Deakin University.
3.12 Data Collection

3.12.1 Interviews

Each face-to-face interview was conducted as follows: the interviewer would explain any relevant privacy or ethical issues in order to gain official consent from the participant. The interview itself was based on a series of pre-prepared open-ended questions (see Appendix 3) with allowances given for discussion to expand and for tangents to emerge (though still within the bounds of the overall topic). Each interview was recorded using a digital sound recording device; this was made clear to the participants beforehand. No handwritten transcription was performed at the time of the interview so that the interview might flow more naturally and uninterrupted. All transcription was completed post-interview (see Appendix 4).

All interviewees were contacted via email to ascertain availability; for those interviews conducted in person, once a mutually suitable meeting time was established, the interviews were conducted either in the participant’s offices or a nearby location. The interviews were conducted over the course of one year beginning June 17th 2010 and ending June 14th 2011. Five interviews were conducted during this period; one participant was an academic, three were developers and one was a government representative. Table 3.1 presents the chronology of interviews.

<table>
<thead>
<tr>
<th>Date</th>
<th>Participant</th>
<th>Length</th>
<th>Type</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>17/06/2010</td>
<td>Academic interview</td>
<td>Approx. 46 minutes</td>
<td>Preliminary</td>
<td>Campus</td>
</tr>
<tr>
<td>18/06/2010</td>
<td>Developer interview</td>
<td>Approx. 50 minutes</td>
<td>Preliminary</td>
<td>Café</td>
</tr>
<tr>
<td>19/06/2010</td>
<td>Government representative</td>
<td>Approx. 33 minutes</td>
<td>Preliminary</td>
<td>Office</td>
</tr>
<tr>
<td>24/05/2011</td>
<td>Senior developer 1 interview</td>
<td>Approx. 96 minutes</td>
<td>Final</td>
<td>Studio</td>
</tr>
<tr>
<td>02/06/2011</td>
<td>Senior developer 2 interview</td>
<td>Approx. 102 minutes</td>
<td>Final</td>
<td>Studio</td>
</tr>
</tbody>
</table>

Table 3.1 Participant interview schedule
3.12.3 Surveys

Two surveys were launched, one aimed at developers and the other at students enrolled in GDE courses. In both cases, links to the surveys were distributed via online services: an intranet or ‘online blackboard’ in the case of university students and Google Docs for developers. The surveys themselves were hosted on Google Docs. Participants were asked to complete their respective surveys once they had given consent (via a checkbox placed at the foot of the introductory paragraph). The survey questions were answerable using several methods; checkbox, radio button or text box. Once completed, participants could then click the ‘submit’ button and the survey results were recorded.

The surveys were launched and made available to participants between May 17\textsuperscript{th} and May 17\textsuperscript{th} 2012. Results were collected and collated on the 26\textsuperscript{th} of May 2012. Surveys were comprised of largely closed questions (age, education, employment history and so on) (see Appendix 1 and 2). To conduct the developer surveys, emails were sent to all available development studios (as listed on the Tsumea site (Tsumea, 2013)). This email contained a brief outline of the research topic, a request for the survey to be completed by any and all development staff and a link to the online survey.

Student surveys were conducted in-house at Deakin University using Deakin’s online blackboard system. Any student enrolled in the game development course (or game development related units) was eligible to complete the survey. Eligible students were asked during lectures or practical classes to complete the survey when possible. Completion of the survey was not made compulsory.

3.13 Ethics and Researcher Influence

Ethical approval (see Appendix 5) to conduct the research using the above methods and tools was sought in late 2009 and approved in 2010. The nature of the research dictated that no participants would be part of a group at risk of exploitation and no particular personal information was to be collected (beyond gender, age, general geographic location and educational history in the case of developer survey participants) from any participant so the research was considered low risk. No participant would be identified
by name or company or asked to provide any identifying details (beyond a strident opinion); the intent was to use more general descriptors, such as Senior Developer or Senior Academic, when referring to interview participants.

The issue of possible researcher bias was considered throughout the research process. Sharing the coding process between two researchers was raised but was hampered by time constraints and availability of an appropriate candidate. Supervisor review of the coding process was deemed an adequate substitute. In addition, the ethical approval process included descriptions of the type of questions that would be asked of participants and how the collected data was to be treated. To this end, an effort was made by the researcher to avoid any pre-emptive questions that might lead an interviewee or survey respondent to respond either positively or negatively. In the case of the developer interviews, neutrality was sought as an opening position and it was not until interviewees indicated a position one way or the other on GDE that the discussion shifted focus to explore this position in detail.

Given the interviews were framed in such a way to allow exploration of tangential topics, comments made by the participants might prompt a further question from the researcher that was not on the original list of questions. In these cases, it is possible that the researcher could focus on negative comments and prompt expansion given the pre-conceived notions of the researcher. Prior consideration of researcher bias was raised with supervisors in an effort to maintain awareness of possible researcher bias during interviews.

### 3.14 Privacy

Participants were not required to provide identifying details (unless they chose to, though no such details are included in this document) in the case of those being interviewed or developer survey respondents. In the case of students, care was taken with regard to the type and tone of questions asked; for instance, any questions about the quality of the course might result in a certain university being painted in a bad light, though anonymity is assured where the online surveys are concerned.
3.15 Chapter Summary

The research design deemed most appropriate for this research topic consists of a mixed methods approach, utilising qualitative data derived from interviews with senior developers and survey data from developers in general as the primary data source. This data is supplemented with quantitative data derived from online student and developer surveys. Data analysis methods include a coding and categorisation process applied to the collected qualitative data in order to identify and extract themes. These themes will form the basis of the discussion in Chapter Five: Discussion. A simple descriptive statistical analysis and summary of the quantitative data is also conducted, presented in Chapter Four: Results and used throughout the discussion to substantiate and supplement the thematic analysis.

This chapter presented the methods used to identify, gather and analyse the qualitative and quantitative data collected and how this data would be used to answer the stated research questions. It presented a number of alternative approaches and determined which was the most suitable and why. This chapter also presented details about the data collection process; who was chosen to participate, why they were chosen, the type of data was extracted from them and how the data collection process was conducted. This chapter also outlined the details of ethics application, privacy issues of respondents, and the issue of researcher bias.
CHAPTER FOUR

Results

4.1 Introduction

This chapter presents the data collected throughout this research project; quantitative data collected from two groups of survey respondents and qualitative data from interview participants; the surveys also contained a small qualitative component. Surveys were administered to Deakin students who were enrolled in one or more Game Design & Development units and to game developers employed in Australian studios. Interviews were conducted with Australian studio heads or CEOs. The qualitative data presented in this chapter is a brief précis of the data collected from interview participants and to a lesser extent the industry survey respondents. The data presented here (see Section 4.4) is intended for use as an introduction to the themes extracted from the qualitative data and to provide a flavour of the more detailed analysis presented in Chapter 5: Discussion.

The chief purpose of this chapter is to summarise and present the survey data, present a brief introduction to the summarised qualitative responses from both interview and survey, and provide grounding for the quantitative data as supplementary material to the qualitative data as outlined in Chapter 3: Methodology. This chapter is not intended as a vehicle for meaningful data analysis; this occurs in Chapter 5: Discussion. This chapter is intended as a reference for the reader to use while examining the analysis presented in Chapter 5.

As described in Chapter 3, the survey data alone does not answer a particular research question, but, in conjunction with the interview data, serves to address the stated research questions. The survey data addresses two of the three research questions in a supplementary role. Those research questions that are partially addressed in this chapter are:

_How are Australian game development courses perceived by the Australian games industry?_
What is the preferred educational background of the average graduate seeking a game development career?

The following survey data is presented in graph and tabular form. The analysis is largely descriptive. This data is supplementary as noted in Chapter 3: Research Design (using a QUAL + quan structure (Morse and Niehaus, 2009)). A portion of the survey data is also qualitative and as such is presented in Section 4.4. Both the developer survey (see Appendix 1) and the student survey (see Appendix 2) consist primarily of closed questions and include a handful of open questions. Responses to open questions are summarised in Section 4.4.

4.2 Developer Survey Results

The following is a series of graphs and tables that summarise the survey responses collected from Australian game developers. Each graph or table will be preceded by a short description. In total, 47 completed developer surveys were retrieved during the period that the survey was made available (17th May 2011 to 17th May 2012).

4.2.1 Demographic Information

This section contains general information about the respondents including age, gender and general location. Table 4.1 lists the age range of respondents. Respondents aged between 23 and 37 constitute 85% of total survey respondents. The mean age of respondents is 30.42 years. The 95% confidence interval for the mean age of Australian developers is 30.42 ± 1.63 years (N = 47). Figure 4.1 shows the distribution of gender; the vast majority (83%) of survey respondents are male. Table 4.2 shows the distribution by location of survey respondents. Fifty-one percent (51%) of respondents listed Melbourne as their location, 31% listed Sydney and the remainder were divided between Perth, Adelaide, Brisbane and Cincinnati (the Cincinnati based respondent is employed by an Australian studio).
<table>
<thead>
<tr>
<th>Range</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 – 22</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>23 – 27</td>
<td>15</td>
<td>18</td>
</tr>
<tr>
<td>28 – 32</td>
<td>11</td>
<td>29</td>
</tr>
<tr>
<td>33 – 37</td>
<td>14</td>
<td>43</td>
</tr>
<tr>
<td>38 – 42</td>
<td>3</td>
<td>46</td>
</tr>
<tr>
<td>43 – 47</td>
<td>1</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 4.1 Developer age range

Figure 4.1 Gender

<table>
<thead>
<tr>
<th>Location</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adelaide, South Australia</td>
<td>3</td>
</tr>
<tr>
<td>Brisbane, Queensland</td>
<td>4</td>
</tr>
<tr>
<td>Cincinnati, Ohio</td>
<td>1</td>
</tr>
<tr>
<td>Melbourne, Victoria</td>
<td>24</td>
</tr>
<tr>
<td>Perth, Western Australia</td>
<td>1</td>
</tr>
<tr>
<td>Sydney, New South Wales</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 4.2 Distribution of respondent location
4.2.2 Education Information

The following tables and figures represent the educational background of the developers that responded to the developer survey. Two terms used throughout this section are game specific and non-game specific. These terms are used to delineate between those respondents who have completed what in this context would be termed a generic qualification and a GDE qualification. Any qualification listed by a respondent that does not use the term ‘game’, ‘game development’ or similar term is considered generic, though the content of a course may be applicable to the skillset of a game developer (a 3D modelling course for example). This distinction is important because a qualification title that contains these game specific terms can reasonably be considered as explicitly game development specific.

Figure 4.2 shows the distribution of respondents according to completion of a qualification. Eighty-three percent (83%) of respondents listed at least one formal qualification at certificate, diploma or degree level. Table 4.3 shows the distribution of qualifications according to the type of institution (university or college/TAFE) listed by respondents. These institutions are unique (for example, if two respondents attended the same university, that university would be listed once). Table 4.4 shows the distribution of qualified respondents versus non-qualified respondents. Two respondents indicated they had acquired a qualification but declined to provide details about the qualification. They have been excluded from the subsequent analysis. Table 4.5 shows the breakdown of qualifications according to type. The two categories are degree level and diploma or certificate level. Thirty-four percent (34%) of the qualifications listed are diploma or certificate level, while the remaining 66% are degree level. Numerous respondents have multiple qualifications (see Figure 4.3), so the categories are not mutually exclusive.

Figure 4.2 Distribution of respondents who possess a formal qualification
Table 4.3 Unique institution distribution as listed by respondents

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Universities listed (unique)</td>
<td>20</td>
</tr>
<tr>
<td>Colleges/TAFE/Academies listed (unique)</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 4.4 Respondent qualification status

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Qualification (degree/diploma/certificate)</td>
<td>38</td>
</tr>
<tr>
<td>No qualification</td>
<td>8</td>
</tr>
<tr>
<td>Possesses qualification but declined to provide specifics</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 4.5 Qualification type (denoted as degree or diploma/certificate)

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree qualifications</td>
<td>31</td>
</tr>
<tr>
<td>Diploma/certificate qualifications</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 4.6 shows the distribution of respondents with generic qualifications versus respondents who possess at least one game-specific qualification. The 95% confidence interval for the sample proportion of Australian developers that possess a GDE qualification is 23.80% ± 12.31% (N = 46). The sample size of 46 excludes the respondent that indicated a qualification but declined to provide information about the type of qualification he or she possessed. Table 4.7 shows the distribution of respondent qualifications denoted non-game specific or general. General qualifications would be any qualification deemed other than game development-specific (Bachelor of Commerce or Diploma of Multimedia). Also included are those respondents with multiple qualifications. The type of institutions (university or college/TAFE) listed by respondents are also included. Respondents who completed honours or postgraduate level qualifications are included. Finally, those respondents who do not have a formal qualification (or chose not to reveal it) are included. Table 4.8 shows the distribution of respondent qualifications denoted game-specific. Game-specific qualifications are denoted by the degree or diploma title listed by the respondent. For example, ‘Bachelor
of Information Technology (Games Design and Development)’ would be considered game specific. Also included are responses that indicate respondents having multiple qualifications; these are divided into game specific and general/game development specific.

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents with one or more general qualifications only</td>
<td>27</td>
</tr>
<tr>
<td>Respondents with at least one game specific qualification</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
</tr>
</tbody>
</table>

Table 4.6 Respondents with generic qualifications versus game specific qualifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents with a general qualification only</td>
<td>18</td>
</tr>
<tr>
<td>Respondents with multiple qualifications (general only)</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>27</td>
</tr>
</tbody>
</table>

Table 4.6 Respondents with non-game specific qualifications

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respondents with a game specific qualification only</td>
<td>5</td>
</tr>
<tr>
<td>Respondents with multiple game specific qualifications</td>
<td>1</td>
</tr>
<tr>
<td>Respondents with multiple qualifications (general &amp; game specific)</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>11</td>
</tr>
</tbody>
</table>

Table 4.8 Respondents with game-specific qualifications

Degree and diploma/certificate totals are included. Several respondents possess both diploma/certificate and degree level qualifications, so the categories are not mutually exclusive. Figure 4.3 shows the distribution of respondent qualifications according to age. The x axis represents the age of respondents, while the table along the Y axis displays categories of qualification. While wide ranging in terms of age, the ‘multiple qualifications’ category features a strong representation from the 33 to 36 age bracket. Unsurprisingly, the distribution of respondents with game-specific qualifications tends toward the lower end of the age range. In the case of respondents with a single game-specific qualification, the concentration is quite narrow (though the low number of respondents in this category is an influential factor).
Figure 4.3 Distribution of qualification type according to respondent age

Table 4.9 shows the mean age of respondents per qualification type. The mean age of those respondents who had completed a game specific qualification(s) was 25.00, while the mean age of those respondents who completed a generic or non-games specific qualification(s) was 32.09. Figure 4.4 shows the percentage of respondents who participated in an internship (or similar introductory program) at the commencement of their game development career. Eighty-seven percent (87%) of respondents had not completed an internship. Table 4.10 shows respondent satisfaction levels of according to qualification type. Of the three responses marked ‘Very satisfied’, two were from respondents who had completed a game specific qualification. Of all 31 respondents, 17 were ‘Satisfied’, 14 ‘Neutral’, two ‘Unsatisfied’ and three ‘Very unsatisfied’.

<table>
<thead>
<tr>
<th>Qualification type</th>
<th>Mean age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi qual. (Game dev only)</td>
<td>25.00</td>
</tr>
<tr>
<td>Multi qual. (Game dev. &amp; General)</td>
<td>27.40</td>
</tr>
<tr>
<td>Single qual. (Game dev.)</td>
<td>25.60</td>
</tr>
<tr>
<td>Multi qual. (General)</td>
<td></td>
</tr>
<tr>
<td>Single qual. (General)</td>
<td></td>
</tr>
<tr>
<td>All game dev. qualifications</td>
<td><strong>25.00</strong></td>
</tr>
<tr>
<td>Multi qual. (General only)</td>
<td>34.00</td>
</tr>
<tr>
<td>Single qual. (General only)</td>
<td>30.17</td>
</tr>
<tr>
<td>All non-Game dev. qualifications</td>
<td><strong>32.09</strong></td>
</tr>
<tr>
<td>No qualification</td>
<td>32.63</td>
</tr>
</tbody>
</table>

Table 4.7 Mean age of respondents according to qualification type
Figure 4.4 Distribution of respondent participation in an internship or similar introductory program

<table>
<thead>
<tr>
<th>Satisfaction levels</th>
<th>Game specific</th>
<th>Non-games/generic</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very satisfied</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Satisfied</td>
<td>5</td>
<td>12</td>
<td>17</td>
</tr>
<tr>
<td>Neutral</td>
<td>4</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>Unsatisfied</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Very Unsatisfied</td>
<td>-</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4.8 Respondent satisfaction levels regarding completed qualification/s

4.2.3 Employment Details

The following tables and figures describe the employment details of respondents. Figure 4.5 shows the distribution of respondents by studio. The studio names are identified with generic labels for privacy reasons. 21 Australian studios are represented in the results, 17 of which are represented by the label ‘Studio E to U’ as each of those 17 studios represents a single respondent. These single studios account for 37% of the responses. The four remaining studios (Studios A to D) account for the remaining 63% of responses. Figure 4.6 displays the distribution of respondent roles according to a set of general categories derived from the survey results. These roles are summarised in table 4.11.
Table 4.9 Broad role categories

<table>
<thead>
<tr>
<th>Designer</th>
<th>Senior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programmer</td>
<td>Audio</td>
</tr>
<tr>
<td>Artist</td>
<td>Writer</td>
</tr>
</tbody>
</table>

The Director and Producer roles were classified as senior roles; these roles would be considered beyond the reach of graduates so can be classified more generally. The same categorisation process also applied to the CEO/owner roles (the CEO role was excluded from the list of categories as it is not considered to be a fundamental game development role).

Figure 4.5 Distribution of respondents by studio
Figure 4.6 Distribution of broad development roles

Table 4.12 also presents the distribution of roles but is specific, including each separate role category as provided by respondents. The total number of roles exceeds the number of respondents because 15 respondents listed multiple roles in response to the ‘current role’ question (see Table 4.13). The right-hand column in Table 4.12 includes roles other than the four main categories or senior category. Table 4.13 represents the number of respondents who list more than one role in response to the current role question. Thirty-one point nine percent (31.9%) of respondents listed multiple (up to six, the highest number of listed roles per respondent) roles. Ranking roles in order of importance was not requested of respondents (e.g. a programmer who contributes a small amount of design work). Table 4.14 shows the distribution by studio type of respondents who listed multiple development roles. Sixty-six point six percent (66.6%) of respondents what filled multiple roles were based in independent studios, while the remaining 33.3% were based in commercial studios.
<table>
<thead>
<tr>
<th>Role</th>
<th>Designer</th>
<th>Programmer</th>
<th>Artist</th>
<th>Senior</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-specific</td>
<td>8</td>
<td>12</td>
<td>3D</td>
<td>3</td>
<td>Director 12</td>
</tr>
<tr>
<td>Level</td>
<td>1</td>
<td>Network 2</td>
<td>2D</td>
<td>2</td>
<td>CEO 6</td>
</tr>
<tr>
<td>Junior</td>
<td>1</td>
<td>Tools 1</td>
<td>Character 2</td>
<td>Producer 4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gameplay 1</td>
<td>Technical 2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine 1</td>
<td>Animation 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>AI 1</td>
<td>Non-specific 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Graphics 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>19</td>
<td>11</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>Leads</td>
<td>1</td>
<td>Leads 7</td>
<td>Leads 1</td>
<td>Leads 0</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.10 Specific distribution of role

<table>
<thead>
<tr>
<th>Number of roles</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
<th>Average no. of roles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>32</td>
<td>32</td>
<td>1.63</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>39</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>47</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.11 Breakdown of multiple roles

<table>
<thead>
<tr>
<th>Studio type</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent</td>
<td>10</td>
</tr>
<tr>
<td>Commercial</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 4.12 Breakdown of multiple roles according to studio type
**4.2.4 Time in the Game Development Industry**

Table 4.15 shows the period time that respondents have been employed in the Australian games industry. Forty-six percent (46%) of respondents had been employed in the local industry for at least six years while those that had been employed for three to six years constituted 25% of respondents. Those that had been employed for less than one year constituted 6% of respondents while the remaining 23% had been employed for between one and three years.

<table>
<thead>
<tr>
<th>Period</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1 year</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1-3 years</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>3-6 years</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>&gt; 6 years</td>
<td>22</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 4.13 Career length to date

Table 4.16 shows the distribution of qualification type according to industry experience. Sixty-three percent (63%) of games-specific qualifications are held by those developers who fall within the ‘1 to 3’ year range. The remaining 37% is split evenly between those in the ‘3 to 6’ and ‘>6 years’ range. None of the three respondents in the ‘<1 year’ range possess a games-specific qualification. The majority (55%) of respondents with non-games-specific qualifications fall within the ‘>6 years’ range. A chi square test for independence was conducted on the data in Table 4.2 (see Appendix 3). The results suggest a strong relationship between period of time employed and qualification type: $X^2 (6, N=46) = 20.02, p = 0.0028 (p < 0.05)$. Figure 4.7 is a visualisation of Table 4.2.
Figure 4.7 Visualisation of qualification type according to industry experience

Figure 4.8 shows the percentage of respondents who had previous experience at one or more game development studios. Seventy-four percent (74%) of respondents listed at least one studio that had employed them previously. Figure 4.8 also acts as a visualisation of the distribution of respondents according to experience level. Table 4.17 shows the distribution of respondents based on their level of prior game development experience. The highest frequency occurred in the ‘1 studio’ category, with 15 respondents (32%) having had previous experience in a game development studio. Thirty-four percent (34%) of respondents had experience with at least two and up to four studios.

Figure 4.9 shows the distribution of respondents by former studios (as listed by respondents). Studios are labelled A up to Studio I for privacy reasons. ‘Studio I’ represents 33 individual studios. The listed studios are a mix of local and international
Several of the listed studios are no longer operating (Tumea, 2014). Studio A accounts for 18% of respondents, Studio B for 9%, Studio C and D for 6%, Studios E through H for 3% percent each, and Studios I for the remaining 49%.

![Figure 4.8 Respondent experience at previous studios](image)

<table>
<thead>
<tr>
<th>Respondents with previous studio experience</th>
<th>Frequency</th>
<th>Cumulative frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 studios (no prior experience)</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>1 studio</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td>2 studios</td>
<td>4</td>
<td>31</td>
</tr>
<tr>
<td>3 studios</td>
<td>6</td>
<td>37</td>
</tr>
<tr>
<td>4 studios</td>
<td>6</td>
<td>43</td>
</tr>
<tr>
<td>5 studios</td>
<td>1</td>
<td>44</td>
</tr>
<tr>
<td>6 studios</td>
<td>1</td>
<td>45</td>
</tr>
<tr>
<td>Previous experience indicated, not specified</td>
<td>2</td>
<td>47</td>
</tr>
</tbody>
</table>

Table 4.15 Previous studio experience
4.2.5 Skills

Respondents were asked to provide a summary of skills they considered important for graduates seeking a game development career. The responses tended to be either broad summaries of game development in general or domain specific skill summaries. Tables 4.18, 4.19, 4.20 and 4.21 show the frequency of certain skills as listed by respondents. Skills are divided into categories; broad skills, programming specific, art specific and design specific. The tabulated skills are not exhaustive; certain skills were excluded due to their being too general (e.g. ‘general software knowledge’).
<table>
<thead>
<tr>
<th>Skills</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>21</td>
</tr>
<tr>
<td>Teamwork</td>
<td>20</td>
</tr>
<tr>
<td>Ongoing learning</td>
<td>8</td>
</tr>
<tr>
<td>Interdisciplinary knowledge</td>
<td>5</td>
</tr>
<tr>
<td>Prototyping</td>
<td>4</td>
</tr>
<tr>
<td>Design</td>
<td>3</td>
</tr>
</tbody>
</table>

Table 4.16 Broad skills

<table>
<thead>
<tr>
<th>Skills</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>C++</td>
<td>15</td>
</tr>
<tr>
<td>Maths</td>
<td>5</td>
</tr>
<tr>
<td>LUA (scripting)</td>
<td>2</td>
</tr>
<tr>
<td>Python (scripting)</td>
<td>2</td>
</tr>
<tr>
<td>Physics</td>
<td>2</td>
</tr>
<tr>
<td>C#</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.17 Programming specific skills

<table>
<thead>
<tr>
<th>Skills</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>3D modelling</td>
<td>6</td>
</tr>
<tr>
<td>Texturing</td>
<td>6</td>
</tr>
<tr>
<td>Maya</td>
<td>3</td>
</tr>
<tr>
<td>Photoshop</td>
<td>2</td>
</tr>
<tr>
<td>Graphic design</td>
<td>2</td>
</tr>
<tr>
<td>Flash</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4.18 Art specific skills

<table>
<thead>
<tr>
<th>Skills</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Broad development knowledge</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 4.19 Design specific skills
4.3 Student Survey Results

This section presents a summary of the data collected from the game development student survey. Each graph or table will be preceded by a short description. 35 completed student surveys were retrieved during the period that the survey was made available. Students surveyed were enrolled in game development units at Deakin University.

4.3.1 Enrolment Information

Figure 4.10 shows the distribution of students according to year level.

![Distribution of respondents according to year level](image)

Figure 4.10 Distribution of respondents according to year level

4.3.2 Industry Aspirations

Figure 4.11 represent student interest in whether they will choose to pursue a career in game development or not. Sixty-five percent (65%) of respondents indicated they would pursue a game development career, while 29% were undecided and 6% would not choose pursue a career in game development. Figure 4.12 shows the breakdown of preferred roles as chosen by students from a set of closed options. The role that listed most frequently was Programming at 43%, followed by Design at 26%. Testing or QA
and Art accounted for 9% each, leaving Audio design at 6% and Writing at 3%. Figure 4.13 shows a comparison between the game development disciplines students listed and the roles included by developers in their survey responses. Programming (32% of developers and 47% of students), designers (17% and 26%), writers (2% and 3%), and audio designers (5% and 6%) are roughly approximate to each other, while 17% of developers identified their discipline as art compared to 9% of student respondents.

Figure 4.11 Plans to pursue a game development career post-graduation

Figure 4.12 Preferred development disciplines
Figure 4.13 Comparison of developer roles versus student’s chosen disciplines

Figure 4.14 shows student preference for a game development internship (if available). Eighty-seven percent (87%) of students indicated they would apply for such a position if available. Figure 4.15 represents student interest for local employment versus overseas employment once graduated; 52% of respondents indicated a preference for overseas employment. Figure 4.16 indicates student preference for a role at an existing company or to start their own development enterprise. The majority (43%) indicated a role within an existing studio would be preferable.

Figure 4.14 Preference for industry internship if available
4.3.3 Student Perceptions of Industry

The following figures and tables describe student perceptions of industry based on survey responses. Figure 4.17 shows student self-assessment of their level of engagement with the games industry through consumption of industry related media (beyond game specific content such as reviews and previews) or attending game development conferences and trade shows. The majority (61%) claim to take an
interest in industry matters and the development process. Figure 4.18 shows student self-assessment of knowledge levels related to game development and the game development industry prior to enrolment (as recalled by enrolled students). This information was collected to ascertain how students perceived game development as a career.

Figure 4.17 Students actively engaging with industry news and media

Figure 4.18 Student knowledge of industry prior to enrolment
Figure 4.19 shows student knowledge of the game development industry (regarding development roles, production and realities of development) based on student self-assessment after having been actively involved in their chosen course. The majority (34%) of students consider their level of understanding to be basic prior to enrolment; post enrolment, the percentage of students listing their understanding as basic has halved. Forty-nine percent (49%) of respondents considered their knowledge of industry ‘Reasonable’; the remainder was evenly split between ‘Strong’, ‘Basic’ and ‘Vague’.

![Figure 4.19 Student knowledge of industry post enrolment](image)

Figure 4.20 shows distribution of extra-curricular game development projects and practice. Fifty-five percent (55%) of respondents listed some kind of extra-curricular development activity (mainly mod development and discipline-specific practice, C++ programming for example). Figure 4.21 shows student understanding of their preferred game development role. Thirty-one percent (31%) marked their understanding as Reasonable, 31% as Basic, 23% as Clear, 12% as Low Understanding and 3% as None. Figure 4.22 shows the distribution of student who prefer to work as a group or individually. Forty-three percent (43%) of students preferred group work, 28% preferred working individually and the remaining 29% were non-committal.
Figure 4.20 Distribution of student extra-curricular game development

Figure 4.21 Understanding of preferred role
4.4 Summary of Qualitative Data

Qualitative data was derived from transcripts of senior developer interviews. A secondary source was the developer survey, part of which requested qualitative answers about GDE. Most comments from the developer survey were volunteered in the “Add any relevant comments” section at the end of the survey. The following is a sample of comments made in response to questions about GDE, both positive and negative. The following comments relate specifically to two of the key themes explored throughout this research; GDE and to the relationship between education and industry.

The process of identifying and coding themes is detailed in Chapter 3: Methodology. To summarise; interviews were transcribed, then coded. The coding process facilitated the identification of key themes. These themes are summarised in the tables below and from the first step in presenting an analysis of the collected qualitative data. These themes are in part dictated by the interview questions; questions directly related to skills, GDE perception, educational institution interaction and the future were asked of interview participants. Other themes arose from the broader discussion, such as graduate opportunities and extra-curricular work. Respondent
comments are listed with the respondent’s seniority (senior being greater than six years, mid-range being one to three and three to six and junior being less than one year in the games industry) and studio type. Studio type is either independent or commercial; the distinction is simply to delineate between the two.

### 4.4.1 Perception of GDE

This theme arose from the general discussion about GDE. Table 4.22 summarises comments made pertaining to GDE. Comments on GDE were largely negative in tone; missed opportunities, validity of games degree in the eyes of the broader IT industry, value of games degrees for graduates, course structure and the gap between education and the reality of the industry are among the topics raised.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Poor standard of coursework being produced. Teachers unskilled.</td>
</tr>
<tr>
<td>Mid-range</td>
<td>Commercial</td>
<td>Game design degrees are a waste of time and money</td>
</tr>
<tr>
<td>Mid-range</td>
<td>Independent</td>
<td>Game specific degrees will hamper job prospects</td>
</tr>
<tr>
<td>CEO1</td>
<td>Commercial</td>
<td>Specialised GDE will become less relevant in Australia</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Students disadvantaged by including ‘games’ in degree title</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Core principles from generic courses are missing from games courses</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Push to use engines like Unity fails to aid programmers in learning their craft</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Disconnection between what students are taught and reality of the industry</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Upon entering industry realised how little had been learned at university</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Industry is dismissive of GDE. Unis/colleges don’t ‘get it’.</td>
</tr>
<tr>
<td>Mid-range</td>
<td>Commercial</td>
<td>Free online resources offer better standard of training than universities or colleges</td>
</tr>
<tr>
<td>Mid-range</td>
<td>-1</td>
<td>Do a straight CS degree rather than a games specific degree</td>
</tr>
</tbody>
</table>

Table 4.20 Negative perception of GDE

---

1 not provided
4.4.2 Interaction With Educational Institutions

Table 4.23 summarises comments that relate to interaction with educational institutions. Current interaction, ideal interaction mechanisms, possible roles for either party (education and industry) in large scale projects and suggested improvements to courses are among topics raised.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO_2</td>
<td>Commercial</td>
<td>Interface with universities in an ad hoc manner. Try to interact as much as possible</td>
</tr>
<tr>
<td>CEO</td>
<td>Independent</td>
<td>Supports GDE, offers internships to secondary and tertiary students</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>Seeking opportunities to collaborate in creation of interesting game projects</td>
</tr>
<tr>
<td>CEO_2</td>
<td>Commercial</td>
<td>Conference dedicated to students focused on getting into industry would be ideal</td>
</tr>
<tr>
<td>CEO_2</td>
<td>Commercial</td>
<td>Trying to tell unis they need to prepare people for games but also a job in general</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>Student projects at OS trade shows conspicuously lacking, possible collaboration.</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>Contacted by university asking for contest judging and prize. Missed opportunity</td>
</tr>
<tr>
<td>CEO_2</td>
<td>Commercial</td>
<td>Coding standards are important and GDE could ensure these are emphasised</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>Maybe there hasn’t been enough emphasis placed on education by studios</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>We lack manpower and universities can put together talented student teams</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>We can represent a student group to contacts and get a game signed, students hired</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>A group that organised those student groups and collected ideas from studios?</td>
</tr>
<tr>
<td>CEO_1</td>
<td>Commercial</td>
<td>With mentoring, student groups can make a compelling high quality prototype</td>
</tr>
</tbody>
</table>

Table 4.21 Interacting with educational institutions
4.4.3 Developer Education

Table 4.24 summarises more general comments about graduate developer education. These comments are not necessarily about required skills or graduate opportunities; issues such as drive, value of marketing and finance knowledge, source and success rate of graduates, role of development methodology knowledge and the value of interdisciplinary experience are raised.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Be sure you want a career in games, otherwise do a straight CS course.</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Value in adopting an Agile-style methodology to guide student projects</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>You can’t learn everything you need to know in 3 years without external projects</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Interest in games is growing; 80% of new grads have done games units of some kind</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Marketing and business/finance knowledge would be valuable in a graduate</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Broader knowledge a must, ability to converse with other disciplines on any level</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Straight CS qualification with optional units in the GD sphere would be ideal.</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>All games grads we’ve hired have succeeded; games course shows they love games</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Most of our artists come from games backgrounds (AIE, Qantm, RMIT)</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Get a cheap qualification and self-teach using online materials, Gnomon etc.</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>GDE is hit and miss: unis slower to adapt than colleges (seen as finishing schools)</td>
</tr>
</tbody>
</table>

Table 4.22 Developer education
4.4.4 Skills

Table 4.25 summarises comments about game development skills, largely those necessary for graduates to be considered as viable candidates for employment in the Australian games industry. A sub-theme that arose from discussion and arose unprompted from survey responses was that of design as a skill.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Team focus, maths, tech smarts, design flair, professionalism, work ethic</td>
</tr>
<tr>
<td>Senior</td>
<td>Independent</td>
<td>Core skill (programming or art) then grow from there after entering industry</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Skilled preferred to less skilled &amp; game specific unless the skill gap is small</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Would take less tech skill &amp; high interpersonal over high tech and low interpersonal</td>
</tr>
<tr>
<td>Junior</td>
<td>Commercial</td>
<td>Game design students tend to lack life skills and professional attitude</td>
</tr>
<tr>
<td>Junior</td>
<td>Commercial</td>
<td>Value ascribed to ability to learn and adapt quickly to new challenges</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Familiarity with middleware (Unity) provided it’s currently in use in industry</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Time management for programmers</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Understand other disciplines (art vs programming), development process</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Object and entity system lifetimes, AI</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Familiar with dev. process; prefer to hire from within industry for this reason</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Teamwork, communication</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Treat every single piece of work as a project. Emphasise project planning</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>If designers don’t know programming then they don’t understand the process</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Good designers have created dozens of games and received much player feedback</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Broad understanding or nearly every aspect of game development is required</td>
</tr>
<tr>
<td>Mid-range</td>
<td>Independent</td>
<td>Student designers come in thinking they know it all: keep learning</td>
</tr>
</tbody>
</table>

Table 4.23 Skills and design skills (sub theme)
### 4.4.5 Graduate Opportunities

Table 4.26 summarises comments made about graduate opportunities. Comments about the hiring process and general eligibility criteria are presented, extending to limiting factors that might impact upon a studio’s capacity to offer graduate positions.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior</td>
<td>Independent</td>
<td>When hiring, discipline-specific skill competency check done first via demo/folio</td>
</tr>
<tr>
<td>Senior</td>
<td>Independent</td>
<td>10% of applicants up to scratch; skills &amp; personal skills checked, qualifications less so</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Would take graduates if revenue stream was more certain</td>
</tr>
<tr>
<td>CEO1</td>
<td>Commercial</td>
<td>Skills shortage no longer an issue, not a relevant issue for a smaller company</td>
</tr>
<tr>
<td>CEO1</td>
<td>Commercial</td>
<td>Large talent pool of experienced developers, no need to seek graduates</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Ideal applicant will show one refined skill; most show 60% level of many skills</td>
</tr>
<tr>
<td>CEO1</td>
<td>Commercial</td>
<td>Too many graduates coming out of institutions, 80% won’t find work in games</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Very limited opportunities in console development for graduates</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Taking sims, serious games and defence into account, possibly under-resourced</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Opportunities exist at the bottom end of the market (e.g. iOS development)</td>
</tr>
<tr>
<td>CEO2</td>
<td>Commercial</td>
<td>Game dev. becoming more global, enhances job prospects</td>
</tr>
<tr>
<td>CEO1</td>
<td>Commercial</td>
<td>Studios use interns to fill roles, but they may not get a job out of it</td>
</tr>
<tr>
<td>CEO1</td>
<td>Commercial</td>
<td>Grads fall behind anyone with a few years of experience, that’s the case right now</td>
</tr>
</tbody>
</table>

Table 4.24 Graduate opportunities
4.4.6 Extra-Curricular Work

Table 4.27 summarises comments made about the value of extra-curricular work for students who aspire to attain a career in game development. The second largest representation of survey responses is found here (bearing in mind those comments derived from the survey responses were in the form of general comments, rather than in response to a particular question).

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO₀</td>
<td>Commercial</td>
<td>Ideal applicant has work done in their own time, not just uni work</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Students kidding themselves if they think coursework alone will get them a job</td>
</tr>
<tr>
<td>Mid-range</td>
<td>Independent</td>
<td>Do all game related work outside of university</td>
</tr>
<tr>
<td>Senior</td>
<td>Independent</td>
<td>No reason why students aren’t releasing games on iOS or Android</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>About their folio, what they’ve done in their own time</td>
</tr>
<tr>
<td>Senior</td>
<td>Commercial</td>
<td>Lack of extra-curricular projects shows lack of dedication</td>
</tr>
<tr>
<td>Senior</td>
<td>Independent</td>
<td>Show your passion for games through making prototypes in your spare time</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Degree is important, but outside work show the guts and gumption to produce</td>
</tr>
<tr>
<td>Junior</td>
<td>Independent</td>
<td>Make a small project of your own and finish it</td>
</tr>
<tr>
<td>CEO</td>
<td>Independent</td>
<td>Invest time in skills outside of the course, e.g. life drawing for an artist</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Unis not a silver bullet; a student’s own work is far more compelling than a degree</td>
</tr>
</tbody>
</table>

Table 4.25 Extra-curricular work

---

² not provided
Table 4.28 summarises comments made about the state of industry at present, both in relation to GDE and more broadly about business and development best practice.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Seeking graduates not a high priority for studios, not really an issue.</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>We’ve used Agile for a long time</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Game development is still in its infancy and changes month to month</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>GCAP is focused on the business side; how do you make money, where do you start</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>We need to be fiscally responsible with graduates</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>We focus on the financial dynamics. Would be great for students to learn this stuff</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>We’re still here because we focus on business, not just making and selling games</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Without investment, no obvious way to facilitate growth in the number of local devs</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Developers have to figure out how to make themselves compelling to investors</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Can’t do work for hire anymore; cheaper to develop in LA than here, no incentive</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Difficult to exist in this environment unless original IP is a focus</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Scrum and Agile development being used, but a clear method not settled yet</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Days of the large scale studio and work for hire are over</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Sustainability is a focus</td>
</tr>
</tbody>
</table>

Table 4.26 Industry
4.4.8 Future

Table 4.29 presents a summary of comments relating to the future of the games industry, both locally and abroad. A sub-theme that arose was the sustainability of independent studios.

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>PS4 last console; cloud is the answer. iOS guys switch to programming for cloud</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Industry starting to standardise, good for education</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Devices only render, gaming will become the new TV. Massive accessibility</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Processing power no longer a barrier. Mid-level development will disappear</td>
</tr>
<tr>
<td>CEO₂</td>
<td>Commercial</td>
<td>Upper end game quality will explode, more developers will be needed</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Determine where investment will come from for original IP. Unclear how GDE fits in</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Experience</th>
<th>Studio type</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Wouldn’t put much stock in them; bar a breakout hit, many are unsustainable</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>A fad because many guys from big studios are trying their hand at it</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>For every Minecraft there are thousands of brilliant but unnoticed games</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Indie studies face barriers restricting platforms &amp; therefore markets to develop for</td>
</tr>
<tr>
<td>CEO₁</td>
<td>Commercial</td>
<td>Difficult for indies to get accreditation from platform holders (i.e. Nintendo)</td>
</tr>
</tbody>
</table>

Table 4.27 Future and Independent studio sustainability (sub theme)

4.5 Chapter Summary

A number of key findings arose from the quantitative data presented in this chapter. Eighty-seven percent (87%) of industry survey respondents had not completed an internship (or similar) with a game development company, while 89% of student survey respondents indicated that they would pursue an internship if available. This demand for such positions is seemingly incommensurate with their frequency in local industry. The split between preferred disciplines as selected students was approximately equivalent to the proportion of roles listed by industry respondents (see Figure 4.13).

Table 4.1 and Figure 4.1 present the age range and gender distribution of industry survey respondents. The results suggest that the average Australian game developer will likely be male (eight in ten) and approximately 29 to 32 years old (30.42
Only three respondents fell within the 18 to 22 age range. The majority of industry survey respondents (74%; see Figure 4.8, Table 4.17) had previously worked at least one other studio, further suggesting that experienced developers from other studios constitute the majority of new hires. Of the 47 industry survey respondents, only 11 possessed game development specific qualifications. Of that 11, only six possessed game development specific qualifications only; the remainder had also completed a ‘generic’ or non-game development specific qualification. The data presented in this chapter indicates a dearth of younger developers in the Australian games industry and a similar lack of developers who have completed game development-specific qualifications.

This chapter is designed to provide the reader with access to a summary of the quantitative data collected via survey for both Australian developers and game development students. It also provides a brief summary of the qualitative data collected from interview participants. The statistical analysis performed on the survey data is largely descriptive and partly inferential, given the supportive or supplementary role the acquired quantitative data plays within this research design. The qualitative data summary in Section 4.4 acts as a bridging device, linking the results chapter and the following discussion chapter by summarising the themes derived from the qualitative data; these themes will guide the following discussion.
CHAPTER FIVE

Discussion

5.1 Introduction

The aim of this chapter is to explore the Australian games industry’s perspective on Australian game development education programs as outlined in the Introduction (Chapter 1) and Literature review (Chapter 2) in order to answer specific research questions. Each of the research questions, results and themes derived from those results, reveal different aspects of the industry perspective. The aim of this chapter will be achieved through:

- analysis of the themes derived from the collected qualitative data;
- supporting this theme analysis by supplementing it with relevant quantitative results;
- drawing a series of conclusions from the theme analysis, supported by statistical analysis of the collected quantitative data; and
- answering the stated research questions with these conclusions.

Structurally, this chapter follows a four-tier format. Each research question will comprise one section. Following each question are the relevant themes as derived from the results. Following the themes are the individual results of the data collection phase; qualitative results form the basis of the discussion and are supplemented by quantitative results. The themes analysed here are summarised in Results (Chapter 4) Section 4.4.

5.2 Structure

There are three research questions and eight themes. The research questions are as follows:

1. How are Australian game development courses perceived by the Australian games industry and why?
2. **What is the preferred educational background of the average graduate seeking a game development career?**

3. **How can Australian game development courses service the needs of industry in the future?**

The themes that form the body of the discussion within each research question include the perception of GDE, industry interaction with educational institutions, an industry assessment of developer education, developer and graduate skills, graduate opportunities, the value of extra-curricular work for graduates, the current state of the Australian games industry and the future of the Australian games industry (and by extension GDE). The themes are aligned with the research question they directly relate to. The questions asked of respondents (both interview (see Appendix 3 and 4) and survey (see Appendix 1 and 2) were informed by the research questions and the themes that emerged from the data analysis phase are therefore also informed by the research questions. The division of themes by research question is presented in Table 5.1:

<table>
<thead>
<tr>
<th>Research question</th>
<th>Related theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>How are Australian game development courses perceived by Australian games industry and why?</td>
<td>Perception of GDE</td>
</tr>
<tr>
<td></td>
<td>Interaction with educational institutions</td>
</tr>
<tr>
<td>What is the preferred educational background of the average graduate seeking a game development career?</td>
<td>Developer education</td>
</tr>
<tr>
<td></td>
<td>Skills</td>
</tr>
<tr>
<td></td>
<td>Graduate opportunities</td>
</tr>
<tr>
<td></td>
<td>Extra-curricular work</td>
</tr>
<tr>
<td>How can GDE courses service the needs of industry in the future?</td>
<td>Industry</td>
</tr>
<tr>
<td></td>
<td>Future</td>
</tr>
</tbody>
</table>

Table 5.1 Research questions and themes

There is some degree of crossover for certain comments in that they apply to more than one theme depending on the context, but on the whole, comments that are considered thematically relevant will be discussed exclusively within the frame of the guiding research questions.
5.3 How Are Australian Game Development Courses Perceived by the Australian Games Industry and Why?

5.3.1 Perception of GDE

The theme of developer perception of GDE was dictated by the opening interview question:

*What is your opinion on the state of game development education/courses?*

This theme was therefore not emergent, but expected. This theme was directly related to the research question *How are Australian game development courses perceived by the Australian games industry and why?*

The request for an assessment of how game development education fits in to the Australian game development landscape was met with comments that were largely derisory, dismissive or generally negative in tone or content. The interviewees, given their seniority, position and experience, offer a high level view of the industry and by extension GDE, and had received their educational qualifications when game-specific courses either did not exist or were present in the form of a few individual units rather than a complete course. Their comments, possibly tempered in some way by the presence of the researcher, were largely measured and diplomatic to a degree.

Some distinctly aggressive comments emerged from the qualitative sections of the developer survey, specifically in response to the final survey question *Please add any comments you feel are relevant or appropriate to this survey.* The assured anonymity of respondents no doubt encouraged said respondents to express their views in stronger terms than they might do if interviewed; nonetheless, many of the comments were dismissive of GDE. Derisory comments aside, a degree of frustration with the quality of GDE courses and education in general was evident from both interviewees and survey respondents. The notion that game specific degrees were a waste of time, produced low standard work (and graduates) and were a hindrance to a student’s capacity to gain employment in a field other than game development were among
assessments offered in response the ‘further comments’ section by industry survey respondents.

**Industry survey comments**

Industry survey respondent comments referred to a lack of core game development principles being taught in GDE courses:

“I feel many students come out with a degree or diploma so specific they wind up being unable to fall back on many other industries. In addition, the core principles taught in generic course are often missed in many games courses”

the gap between the content students were exposed to at tertiary level and the reality of industry:

“There were no formal games educational programmes available when I entered the industry over 12 years ago. This is changing dramatically, however there is still a disconnect between what students are taught, and what is reality in the industry”

and the notion that free online resources provided more relevant material to students than fully fledged GDE courses:

“The best way to learn the trade is via the many online resources, tons of places have tons of tutorials for free that are of a significantly higher standard than that of any physical training institute here in Australia”

“I’d advise students to do the cheapest course possible to get a bit of paper (useful overseas though I’ve never had to use it) and teach themselves using Gnomon stuff, tutorial books, online stuff, anything they can get their hands on, and get their work peer reviewed online rather than from friends (if it's art related) as the feedback will be more honest and useful.”

The implication that GDE courses were a waste of money was explicitly stated by several respondents:
“I also think that games design degrees are a waste of time and money. They barely scratch on any of the different parts of design for games so a person finishes the degree and thinks they can be a gameplay design or a level designer when really all they have learnt is what design in other industries is like.”

“(institution offering 3D modelling course) was a complete waste of time. I’ve heard very similar stories from many other people who went to different educational facilities.”

The disparaging comments from developer survey respondents, in isolation, speak of experiences that are not necessarily indicative of a broader problem with GDE courses. However, although each comment differs in subject, each refers to some aspect of GDE that they see as problematic. Of the respondents who chose to add further comments, only one of the 11 respondents who had obtained a game development specific qualification was among them. This may suggest that those developers that had completed a GDE qualification and found employment were satisfied with the standard they were exposed to, though the size of the sample precludes any definitive assertions.

This comment referred to GDE students and their lack of professionalism in a work environment:

“I find that a lot of game design students seem to lack general life skills or the professional commitment and conduct to work in an office environment. It would be great to be able to prepare younger students to be able to apply to work professionally and conduct themselves as expected in a company.”

Obviously this issue is not unique to the games industry; the preparedness of students for clinical placements is an issue for clinical educators (Chipchase et al., 2012). All bar one of the comments that directly addressed game development-specific education were from respondents who possessed generic or non-game development specific educational backgrounds (or did not possess a qualification). Those without a qualification were largely senior (greater than six years in industry), suggesting their comments were informed by exposure to game development specific course graduates either through interviewing for positions or liaising with tertiary institutions.
The survey respondents who offered comments on GDE tended to describe the issues with GDE as they saw them. As they were responding to an online survey, it was not possible to seek an elaboration on their comments. The two game development studio CEOs, given the opportunity to speak more expansively on the topic of GDE during their respective interviews, offered more insightful comments (as expected) than the survey respondents.

Validity of games courses

CEO1 highlighted the validity of GDE in the future:

“I have concerns about unis that specialise in game development; I think in the future that will become less and less relevant in Australia”

Expanding on this point, the CEO1 raised what would become a common theme:

“Comes down to the same thing it always has: if you’re prepared to do the work outside the set hours and have an affinity for the work you’ll be great”

These and other comments about extra-curricular activities (relevant to the discipline or game development broadly) appeared with such regularity that they constituted their own theme, specifically the value of extra-curricular work (covered in Section 5.4.2). However, this comment also has value in this context. This comment indicates that the perceived value of a graduate is determined to a significant degree by the quality of his or her folio, typically developed outside course hours. By extension this suggests that however the core skills are delivered, proof of the application of those skills is required. This means of assessing graduate competency evidently does not necessitate dedicated games courses in the eyes of developers; in the case of programmers, Computer Science degrees are typically favoured over GDE specific degrees where programmers are concerned. This is clarified by CEO2:

“One of the worst things in my opinion, and it probably goes against some of the other roles I have in the industry, but one of the worst things you can do to a student, is put in brackets on their education (degree) ‘games’ “
“I think it’s a really bad idea. I think it should be BCS or whatever, but don’t put games in the bracket. To the broader audience, it’s not seen as professional.”

and by a survey respondent;

“Any degree with the word 'game' in the title won’t get you a job. Get a pure Comp. Sci. degree”

This assertion that GDE specific qualifications are of lesser value than others is supported by the survey results. Of the 47 survey respondents, 39 hold qualifications (one of these declined to provide details of their education). Of this 39, 11 possessed a GDE specific qualification (see Chapter 4: Results, Section 4.2.2, Table 4.6). Of the 11, five had both a GDE specific and a generic qualification while the remaining six had acquired a GDE specific qualification only (see Chapter 4: Results, Section 4.2.2, Table 4.6). This suggests that those graduates who achieve employment are generally not from a GDE specific background.

**GDE qualification value**

A comment from CEO2 about graduates of GDE courses offers one seemingly positive note. In response to a question about experience dealing with GDE graduates:

“Of the games course grads we’ve hired they’ve all worked out, 100%. It probably says something about our hiring process, but it probably also says that if they’d done a games course then they want to do it (games) and if they have an attitude and an aptitude, they’ll get there.”

The comment about hiring process is telling and makes it difficult to discern how many unsuccessful applicants have GDE specific qualifications. A limitation of this study was the lack of a follow up question directly asking the proportion of applicants that held a GDE specific qualification or a GDE specific qualification combined with a generic qualification (assuming such information was readily available).
The latter part of the above comment:

“… but it probably also says that if they’d done a games course then they want to do it (games) and if they have an attitude and an aptitude, they’ll get there.”

is perhaps encouraging for GDE graduates in that completing a GDE qualification marks their keen interest in the field; passion is an oft-cited pre-requisite for game developers (Makuch, 2013) so this perception, if consistent, would be a welcome one for applicants with a GDE background.

**Satisfaction levels of respondents**

Table 4.10 shows survey respondent satisfaction levels regarding their education experience. Of the three respondents who were ‘very satisfied’, two were GDE graduates. Five further GDE graduates were ‘satisfied’ and the remaining four were ‘neutral’. Of the seven satisfied to very satisfied respondents with GDE specific qualifications, six had completed GDE specific degrees only. No GDE graduate was less than ‘neutral’ in their appraisal of their educational experience. Five respondents marked themselves as ‘unsatisfied’ and ‘very unsatisfied’. Each of these respondents had generic qualification; two marked ‘unsatisfied’ and three marked ‘very unsatisfied’.

This data raises several questions; how did the respondents determine how to rate their experience? Are the satisfied respondents satisfied because they gained employment in the games industry? Did the unsatisfied respondents initially fail to gain employment therefore colouring their view of the course they enrolled in? Follow-up questions about why respondents were or were not satisfied with their education experience would be beneficial, though some did offer an expansion in the further comments section (“[institution offering 3D modelling course] was a complete waste of time”). Despite the positive experience of the majority of the GDE graduates, the number of GDE graduates constitutes only 28% of all qualified respondents.

The aforementioned hiring process, the suitability of individual graduates (demonstrating technical and interpersonal competency) and a strong folio appear to be the determinate factors for graduate job prospects, rather than the perceived value of a
specialised GDE qualification. As noted above by respondents, a GDE qualification may in fact hamper graduate prospects of employment in game development or otherwise.

**Perception of GDE educators**

A comment made via the developer survey by a senior developer from a commercial studio further cements the dismissive attitude of developers toward GDE:

“I’m self taught mainly, and I look at the work coming out of these hugely expensive courses and a lot of it is rubbish. Absolute rubbish. The teachers are often unskilled themselves and seem to often have little to no industry experience... These "schools" only want your cash. I think a lot of them should be shut down quite honestly.”

This comment offers a particularly disdainful view of GDE. It is not clear how this view was formed; the respondent does not possess a GDE specific qualification (a fact consistent with the background of survey respondents who express a similar view), nor cites specific examples of their experience that lead them to offer such a comment. Aside from the invective tone, of concern is the comment about teachers (The teachers are often unskilled themselves and seem to often have little to no industry experience). This statement echoes past comments made by Australian developers about the distance between education and industry (Haukka, 2011, p. 36), in turn indicating that, perhaps, little has changed (either in reality or at least in the view of developers).

This view is supported via comments made by CEO2:

“I had someone the other day email me from a university saying the students were doing little projects and could we provide a prize and it seemed like he was missing an opportunity.”

CEO1 adds to this comment:

“That shows a fundamental lack of understanding on the business side of things. If you understood that the developer was right at the bottom... we can’t
even get a copy of the game. We might be good at judging a game competition, but so might anyone else.”

This perceived lack of understanding of game development on the part of education is consistent with the assertion that seemingly few lecturers hail from a commercial game development background.

**Reluctance of educators to engage with industry**

There are undoubtedly numerous academics who are keen to liaise with developers to ensure content and techniques are current (McGill, 2008) (Swain, 2009), but further comments support the notion that there is a reluctance to engage with industry, or perhaps ignorance of the value of industry input. These particular experiences suggest a misunderstanding of where a developer sits in the larger game development pipeline and, in turn, the business of game development itself.

“(in conversation with an academic) “It’s great that you are teaching Java, but your guys aren’t going to get in purely on Java” and the main stream was based on Java. He said “That’s where the industry is going to go” and I had to say “I don’t think so”. You at least need to give your students a plan B. Don’t lead them down the Java path until it’s Java Java Java Java.”

The concern about the direction of education was evident during the interviews. In order to gauge where the industry is at (and where it is headed) on a micro level, such as choosing the appropriate programming language for students to focus on, consultation with industry is surely required. The frustration at the perceived tendency of education to remain distant from industry in this sense is evident in many of the comments; in the case of interviewees, a sense of resignation was palpable. Swain (2009) expresses a level of frustration on the part of developers who seek to liaise with education, citing a lack of organisation across schools. The interdisciplinary nature of game development necessitates such inter-school collaboration. This frustration is reflected by CEO2’s comments about ex-lecturers on staff:
“I’ve got some ex-uni lecturers here, because of this. Because they went in with all the right intentions and they love imparting knowledge only to have them slapped with “No, you need an upward shift, the bell curve starts at 50” so we’ve got a lot of disenfranchised ex lecturers, guys that work with us that are out of education, which is sad.”

This comment links to the aforementioned survey respondent’s comment about a lack of industry experience and game development skill among teachers within GDE courses (“The teachers are often unskilled themselves and seem to often have little to no industry experience”) and suggests a problem that is twofold: teachers with development skill are required in institutions that offer specialised GDE course, but attracting developers into educational roles and subsequently retaining those developers may be problematic.

The following quote, offered by CEO1 as an attempt to summarise the industry view of GDE, neatly encapsulates the arguably central issue:

“I guess the thing is that… speaking in general of our industry, the industry is fairly dismissive of education. They think that universities, colleges and so on, don’t get it. They don’t think in general that they have the ability to help them ‘get it’. That it falls on deaf ears. A lot of the guys you speak to “KNOW” it and you know that old saying that you can’t teach people what they already know”

Overall, the above comments suggest a negative perception of education in terms of graduate quality, skills, validity of GDE, educator knowledge and willingness to collaborate with education. This perception is supported by the statistical data: as mentioned previously, despite the presence of 28 specialised game development specific courses in Australia (Tsumea, 2013), only 11 of 39 qualified survey respondents possess a game development qualification. Of that 11, five possess both a game development qualification and a second generic qualification (see Table 2.4). This leaves six survey respondents who have completed a GDE specific qualification only.
This negative perception is supported by the qualitative data: of all the comments made about GDE, any of the handful of positive comments also came with a caveat, such as the remark about 100% of games graduates working out being balanced by the suggestion that the hiring process was the determinate factor. The perception that GDE courses are being managed by lecturers who do not themselves possess the requisite skills is potentially harmful to the relationship between education and industry and accentuates this apparent divide. The suggestion that courses are being created and directed without adequate input sought from industry is apparent here.

This negative perception is supported by the quantitative data; as stated in Chapter 4: Results, Section 4.2.2, the 95% confidence interval for the sample proportion of Australian developers that possess a GDE qualification is 23.80% ± 12.31 (N = 46). Given a 95% certainty, at worst approximately one in ten developers possesses a GDE qualification and at best, one in three. Given an institution that offers dedicated GDE courses can reasonably be assumed to envision a career in game development for graduates of such a course, surely the ratio of GDE qualified developers to non-GDE qualified developers should be higher. Finally, this negative perception is supported by literature. Eighty-four percent (84%) of respondents to a developer survey in service of an industry report by Haukka indicated that games courses were ‘highly ineffective’ (Haukka, 2011). Numerous other examples of industry dissatisfaction with GDE programs are summarised in Chapter Two: Literature Review, Section 2.2.

Theme summary

The following is a summary of the key points raised by this section. These points serve as a partial explanation for the negative perception of GDE as held by research participants.

1. Industry is dismissive of education following unsatisfactory interaction with educational institutions; industry currently sees little value in engaging with said institutions (possibly due to absence of need for graduates – see Section 5.4.3)
2. Educators fail to impart fundamental elements of game development to students. This is reflected in graduate quality. The alleged lack of skilled
practitioners within education (and apparent loss of existing ones) adds to the problem.

3. Educators are perceived as unwilling or unable to utilise advice (if sought in the first place) offered by industry and prefer their own methods.

4. GDE qualifications are not valued by industry and can potentially hinder graduate employment opportunities. GDE qualifications lack credibility in the minds of employers and online resources offer a better education to students than a dedicated GDE course.

This section offers a snapshot of attitudes toward GDE as held by developers currently employed in the Australian games industry. This discussion does not assert that these attitudes offer a holistic view of the problems faced by educators when developing game development curricula; clearly, only the industry view is offered. This discussion does however raise points of interest for educators seeking to improve the quality of GDE graduates or industry relations. It also offers possible influential factors for the apparent divide between industry and education. One key reason for this divide is the manner in which education and industry have collaborated in the past; this aspect of the discussion is explored further in the following section.

5.3.2 Interaction With Educational Institutions

According to results discussed in the previous theme, the Australian games industry’s perception of GDE is influenced by two elements; GDE graduate competency (as might be assessed in job interview situations) and interaction with the institutions that produce these graduates. GDE graduate competency and graduate opportunities are discussed in Section 5.4.3. The theme of industry perception discussed responses by research participants that illustrated the negative perception of education; this theme, interaction with educational institutions, examines the experiences and impressions of industry that potentially influenced those perceptions.

As with the previous theme, it was expected that industry perception of education and GDE specifically would be based on participant experience of education on some level. Interviewees were questioned directly about interaction with educational institutions. Survey respondents were not asked specific questions on this
topic as it would not be possible to know whether respondents had any relevant experience upon which to base their contributions. Therefore, all responses that are relevant to this theme are from interviews. Comments range from reflection on current interaction with education to suggested improvements to GDE courses and possible additions and adjustments to the industry-education relationship.

**Industry/education collaboration**

Questions directed at interviewees explored the notion of industry-education collaboration, their role within that framework and their experiences of it (if any). The following question:

> What (if anything) do you need or would like to see from universities?

prompted an interesting response from CEO1.

> “One thing that does spring to mind is I know that (overseas) unis do have game dev teams that create projects and I think that’s something in Oz that’s lacking quite conspicuously. I think that’s something that would be really interesting to see from a studio perspective. I think if institutions created more of that, then there’s a really exciting opportunity for collaboration with studios because what we lack in manpower… unis have great access to manpower and they can distil the really talented students into teams and create projects”

CEO1 identifies two issues: a lack of visible student output that studios can engage with and an evidently valuable resource for developers; specifically, a talent pool of students with which to collaborate and ultimately hire. The notion of inviting developers to view student work is identified by Swain as a viable means of establishing industry links and exposing developers to student work (Swain, 2009). CEO1 continues:

> “So then there is a potential for collaboration if a uni team can produce a title that is compelling, even in an indie mould or prototype or whatever, we can potentially represent that to our contacts and create a relationship where the
game gets signed, the students get hired, they create the project that they’ve started and it works for us as well because we can take it to the next level.”

The above quote contains an important point; as a result of the experience gained through working with a team of developers, the “students get hired”. Internships are rare in Australian game development, likely to become more so recently given the diminished developer numbers and increase in the number of companies (Pink, 2013). CEO1 operates a smaller studio and states that his studio is unable to offer traditional internship positions; what the above suggestion provides is a possible means of developers interacting with students without the imposition of a full-time graduate on staff that would require training. For smaller studios, an inability to offer internships may also contribute to a reluctance to engage with education.

CEO1 outlines the concept further:

“If the students aren’t coming up with concepts that are compelling enough, or commercially viable enough, we have a huge catalogue of concepts and the only reason we can’t do them is we don’t have the manpower to do them. Our ideas go through a process of commercial viability”

“The uni has the manpower to do what the studios are unable to. It’s a good idea if it works... The uni gets their name out there in that way and the studio gains the profits.”

CEO1 comments further on the issue of allocating time to such projects:

“It wouldn’t be much of a time drain to look over some code or art and write up an email suggesting the team check out this or that reference, it’s not onerous and it would only be a few hours a week.”

This point about the value of mutually beneficial (or at least convenient) collaboration between industry and education is important as a studio (like any business) has limited time to devote to any endeavour that is not in their commercial interest. However, as outlined above, there are mutual benefits to such an endeavour and any impositions on developer time are balanced by a tangible outcome of potential commercial value to the studio. This emerges as a key point: enhance student learning
via developer expertise while ensuring a tangible benefit to the developer for their investment of time.

**Organisation and mutually beneficial interaction**

CEO₂ was not directly asked the same question as CEO₁ as the topic had been covered indirectly throughout the course of the interview. Related responses are as follows:

“We’re doing some things in Footscray, we’ve done some things at [institution], but there is no co-ordination. I’ll get a request from [institution] or I’ll get a request from Deakin and we’ll furnish the request, but there’s no grand plan, there’s no ‘Uni Games Week’”

The desire to interact with education in a manner that suits developers is supported by the following comments from CEO₂:

“It would be great if Deakin put an auditorium aside for an entire week and you’ve got industry speakers for the entire week, focused on education and university education and what you might do when you leave, I think that would be a great idea. I think if you have that, industry would be happy to do it and support it, because it’s focused. Industry know that there’s this one week, and they’re going to supply people for this week.”

Several related phrases emerge from these comments, those being ‘no co-ordination’, ‘no grand plan’ and ‘industry would be happy to do it and support it, because it’s focused’. These terms suggests a degree of frustration at this apparent lack of co-ordination and lack of convenience, but is coupled with a desire to collaborate with tertiary institutions given the right conditions. To follow, in response to the question:

“Would you be willing to work further with educational institutions to assist in improving the quality of graduates?”

CEO₂ responded:
(on collaborating further with education) “We already do, we just do it in an ad hoc manner... It makes sense to have a grand plan and big picture”

These comments raise issues about the nature of the interaction between industry and education. Comments from CEO2 indicate an informal relationship with education and a desire to establish a formal, organised relationship. This apparent lack of co-ordination is a possible contributor to the negative perception of education. However, formalised interaction between education and the Australian games industry may be difficult to achieve due to diminished developer numbers and smaller studio sizes (Pink, 2013) and therefore reduced need for graduate developers. CEO2 offered further comments on interaction with education:

“We interface with a lot of universities. Only a few days ago I was speaking for a few hours at [institution], spent the day up there. On Friday there’s [institution event], I’ll have guys from here going up to speak, so we try and interface as much as we can, to let unis and educators know where we’re headed”

The question of collaboration with education was framed differently with the other interviewee (CEO1) as that interview had evolved into a general discussion about methods of collaboration. CEO1 admitted that he (and by extension his studio) has limited contact with institutions:

“I don’t think we’ve had any contact with anyone who’s come through a game design course, we don’t employ people straight out of uni”

As such, interaction with education was very limited as CEO1’s studio does not typically hire graduates.

Visibility of Australian GDE students

Institutions that offer GDE courses often refer to industry links via course information as a means of asserting the validity of that particular course (RMIT, 2013). This is common practice regardless of the discipline or industry, but where GDE perhaps differs is in the ad hoc nature of those links as highlighted by CEO2.
CEO1 commented on the visibility of institutions overseas:

“When I go to GDC and they have the indie game section of GDC they also have an educational section and I don’t think I’ve ever seen an Aussie uni represented there. It makes me wonder, does that imply that Australia lacks that talent to create something original and independent, does it mean that unis are not willing to provide an opportunity for students to get recognised on a global stage?”

A portion of the above comment reinforces the negative perception of GDE:

“...does that imply that Australia lacks that talent to create something original and independent, does it mean that unis are not willing to provide an opportunity for students to get recognised on a global stage?”

While student projects are presented at local festivals such as Melbourne’s Freeplay, the suggestion that such projects are absent at international events is noteworthy. The Independent Games Festival, established as an extension of the Game Developer’s Conference, is an internationally recognised event and features student created games alongside independently developed games. The 2012 and 2013 lists of student-developed entries do not feature entries from Australian students or institutions (IGF, 2012) (IGF, 2013).

Whether Australian institutions that offer GDE courses are actively involved in promoting student work or not (or involved to a sufficient degree) is unclear given the limited data on the topic. However, a lack of global visibility (perceived or otherwise) would potentially create a perception that Australian GDE educators are not actively engaged with the development community. A comment from Section 5.3.1 is relevant here:

“(in conversation with an academic) “It’s great that you are teaching Java, but your guys aren’t going to get in purely on Java” and the main stream was based on Java. He said “That’s where the industry is going to go” and I had to say “I don’t think so”. You at least need to give your students a plan B. Don’t lead them down the Java path until it’s Java Java Java Java.”
In context of the GDE perceptions theme, this comment spoke of a possibly narrow view on the part of educators, or considered as such by industry. In this context, it furthers the notion that educators are too far removed from the game development sphere. Seeking advice from industry rather than asserting its direction, Australian GDE visibility at international events, actively engaging with developers in mutually beneficial proposals; these issues are evidently failing to be addressed in the minds of developers and colour their perception of GDE. CEO2 summarises the conversation with education:

“I’m trying to get across to the universities that what they should do is prepare people, act as a launching pad, to prepare people to get to the pointy end, but also make sure that they have a job.”

The above comment about ensuring graduate employability (either inside or outside the games industry) is linked to issues of employability raised by respondents in Section 5.3.1 and reinforces a key concern of industry when interacting with education.

A degree of concern for the welfare of GDE graduates is evident in the response from CEO2 and reinforced by the collated responses. CEO2 states that institutions should “make sure that they have a job”. This suggests the value of a customised talent pool is outweighed by concern that students are employable in industries besides games and that the games suffix harms employment prospects, even within the games industry.

**Theme summary**

The above comments indicate that overall, developers are willing to interact with education. The following points summarise the issues and suggestions raised by developers on the theme of interaction with education:

1. Developers are willing to liaise with education but are frustrated by a lack of organisation and co-ordination among institutions.
2. Collaborations with commercial potential (such as the student teams using studio concepts as raised by CEO1) are appealing to developers and the
resources offered by a university in terms of manpower are also appealing in this context.

3. Following from the second point, interaction or collaboration between industry and education should ideally be mutually beneficial or at the very least optimised to make efficient use of developer time given their commercial concerns.

This section summarises developer experiences of interaction with education and offers ideas for improved interaction between the two stakeholders. The discussion is limited given the small sample size, but the seniority of the two participants lends validity and credibility to their statements. As with the previous section, suggestions raised by participants are potentially of use to educators.

5.3.3 Summary

The Australian games industry and tertiary institutions that offer GDE courses have a difficult relationship. Industry dis-satisfaction with the quality of graduates and methods both locally (Haukka, 2011) and abroad (Humphries, 2008) (EDGE, 2013) (Swain, 2009) is clarified.

The listed themes were explored in order to answer the following research question:

How are Australian game development courses perceived by Australian games industry and why?

This question is informed by published commentary from industry figures, published literature, previous studies and personal experience. Interviews were conducted with selected senior Australian developers and Australian developers at large were surveyed to ascertain how GDE is perceived by industry. The short answer to the above question is as follows: Australian game development courses are perceived negatively by Australian developers because of less than satisfactory graduate quality and problematic interaction with educators. Virtually all comments on GDE were negative in tone, particularly from survey respondents. Interviewees were more
measured in their appraisal of GDE but rarely positive about the state of GDE as they saw it.

While the exploration and analysis of these themes answers the research question, as an outcome it is rather simplistic. The underlying cause of how this perception was formed and the exploration of the particular issues faced by the senior developers when dealing with tertiary institutions was explored and revealed by respondents in the findings detailed in each theme summary. It is important to note that the developers interviewed, unsurprisingly, are passionate about imparting their knowledge to a younger generation of developers. They are happy to participate in programs that aid the development of student game developers; indeed many already do and have done since game development became a recognised vocation.

Finding mutually beneficial methods of interaction, such as those suggested by the interviewees, is key to strengthening the evidently troubled relationship between education and industry. As reported in the recent ABS industry survey, developer numbers have declined by nearly two thirds, but the number of companies has nearly doubled (Pink, 2013). The next phase of Australia’s game development industry will be in part shaped by education; the following section deals directly with the attributes a graduate seeking a game development career should possess according to industry.

5.4 What is the Preferred Educational Background of the Average Graduate Seeking a Game Development Career?

5.4.1 Developer Education

This theme is directly related to the above research question and is addressed by both survey and interview data. As with previous themes, questions asked of interviewees on the topic of developer education differed and diverged depending on the responses offered by each participant. Much of the discussion about developer education was programming related (each interviewee had a programming background). Survey questions asked respondents to list their educational background (if any) including
Qualifications, majors (if applicable), satisfaction levels regarding their time in education and the institutions in which they completed any qualifications.

Comments made by developers (via the survey) and CEOs (via interview) were generally consistent in their appraisal of what they deemed important in an applicant’s educational history. As raised in earlier themes, concern about the generalisability and transferability of a dedicated GDE degree was also present in this theme. CEO1 commented on the advised route for an aspiring developer:

“If you’re absolutely sure you want to work in the industry, go to AIE (Academy of Interactive Entertainment) or QANTM (Queensland and Northern Territory Multimedia) but otherwise, you should just do a generic CS course and take subjects/electives that are GD specific but it gives you a good grounding in general IT and CS if you want to move to another IT or programming related field or if you want to go OS then CS is globally recognised.”

The issue of transferability of skills and qualifications is evident here. The importance of pursuing a generic computer science (or CS) course in preference of a dedicated GDE course is underlined by CEO2 and CEO1:

“The hardest programming you’ll ever do is in games. There’s no doubt in my mind; I’ve done so much programming out there in different facets and games is the hardest. However, the way it’s viewed is that games are ‘fun’”

“I see so many guys who do 6 months to a year of game development and realise that the money’s crap and the working conditions are outrageous for the money, unless you really love GD and the people you work with compared to what else you can do; better money for doing not much comparatively.”

“It’s CompSci games. Give them a CompSci, make sure they’re proficient with C, make sure they’re proficient with Java, and have a general understanding, and then they’re majoring in the games stuff, the graphics stuff but at least give them a chance to get a job somewhere else in case they need to.”

These comments highlight the difficulty of game development and warn against dedicated GDE courses as a graduate path. If the above comments are accurate
regarding the validity of GDE courses outside of the games industry and the challenging nature of game development as a career, a student that opts to enrol in a GDE course should be aware of both issues. CEO\textsubscript{2} offers a summary of GDE graduate numbers within his own studio:

“I don’t think there’s many (games grads). If I take the entire company, compsci side, I’d say 25% have done some game specific compsci or majored in games somehow, or graphics. Of new graduates that have come out, I’d say 80% of them have done game/graphics specific compsci. It’s growing. They particularly want to be in games.”

The portion of the above comment concerned with new graduates (Of new graduates that have come out, I’d say 80% of them have done game/graphics specific compsci. It’s growing) does not specify if those graduates have completed GDE specific courses (with a CS foundation) or have simply majored in those areas within a generic CS course. Regardless, the notion that graduates are increasingly interested in these fields (and by extension game development) raises concerns about which path those future graduates will take.

A preferred path for aspiring developers is outlined by CEO\textsubscript{1}:

“I would like to see straight CS courses with a lot of optional subjects in the GD sphere. When I did my course there were one or two vaguely game-related units that weren’t specifically about games, but there was crossover (rendering 3D images for example).”

This model is consistent with the previous comments regarding the wider utility of generic CS courses and is supported by related quantitative survey data (Chapter 4: Results, Section 4.2.2., Table 4.6). As stated in Chapter 4: Results, Section 4.2.2, the 95% confidence interval for the sample proportion of Australian developers that possess a GDE qualification is \(23.80\% \pm 12.31\) (\(N = 46\)). The majority of developers surveyed possess a non-GDE qualification. This data suggests that the preferred educational background of an applicant is generic, or non-GDE based. Of the 39 respondents who listed their educational history, 11 had completed a GDE qualification. Of that 11, only six possessed GDE qualifications (the remaining five possessed a generic qualification in conjunction with a GDE qualification).
Combined with the above comments, the data suggests that the recommendation against enrolling in a GDE courses due to lack of utility outside the games industry is supported by the industry at large preferring non-GDE qualified applicants when hiring. The growing number of graduates with a graphics or games focus as highlighted by CEO2 should, according to these results, choose a generic CS course and elect to study games and graphics related units, rather than a dedicated GDE course, lest they find themselves unemployable both within the games sector and the wider IT industry.

CEO2 offered comments on the difference between universities and colleges:

“(on GDE courses) I think they’re hit and miss, there’s a wide variance between what I would think is applicable and not. So the universities in my opinion, tend to be slower at reacting to the market than the private institutions, however, the universities turn out better graduates. So, to the point where I see the private guys as finishing schools.”

These comments offer insight about the role of the respective institution types and how they might be best utilised by students. The notion that private colleges are best viewed as finishing schools is partially supported by the survey data. Of the 11 survey respondents who had completed GDE qualifications, six of them had completed multiple qualifications. These respondents had completed a degree, diploma or certificate level qualification and completed a GDE specific qualification. One respondent had completed a GDE degree-level qualification and then completed a diploma level qualification at a private GDE-focused college. The remaining five had either completed a generic degree-level CS course and then a GDE specific diploma level course, a GDE diploma then a CS degree, a double degree with a games major or two diploma level courses, the second being GDE focused.

The number of respondents who had completed GDE courses is too low to provide a substantial corroboration of the notion posited by CEO2; however, it would seem reasonable that if graduates have a generic qualification (which would seem to be the preferred option for studios, particularly for technical roles), supplementing that qualification with domain specific training at a GDE specific private institution would be advantageous to graduates. Survey data analysis suggests graduates with a generic
qualification tend to be preferred over graduates with a GDE qualification, but the two combined may be beneficial to graduates.

The above comment from CEO2 also highlights a potential advantage that private institutions have over universities; currency. Technical proficiency is highly valued by the games industry (as discussed in Section 5.4.3: Extra-curricular work) (McGill, 2008) so the characteristically specialised and vocational nature of a private institution’s courses versus the more theoretical grounding offered at a typical university should, in theory, ensure the content delivered to students is current and relevant. Remarks by participants in Section 5.2.1 indicate a negative view of GDE in general; neither universities nor private colleges are singled out as being better worse than the other.

CEO2’s comments (universities... tend to be slower at reacting to the market than the private institutions, however, the universities turn out better graduates) give some clarity to the question of respective strengths from the industry perspective. It is important to note that universities, despite being labelled as ‘slower to react’, produce graduates considered by CEO2 to be of a better standard than those from private institutions. CEO2 clarifies the divide on a technical level:

“The coding standard for a games grad is not as high as that for a pure compsci grad.”

These comments are supported by results obtained from the developer survey. Qualification types derived from the developer survey sees 47 total qualifications listed from 38 respondents. Of the 47 qualifications, 31 are degree level qualifications, the majority of which were obtained at universities. These numbers are linked to the number of unique institutions listed. Thirty institutions total were listed; 20 universities and 10 colleges/private institutions. Based on the collected data, degree level qualifications are preferred.

The survey data applies to any game development role, while much of the qualitative data discussed to date applies to technical roles. Of the respondents who had completed a GDE qualification, three were employed as visual artists and one as a junior designer. CEO2 commented on the background of their studio’s artist contingent:
“Most of our artists have come from games backgrounds. So, they’re Qantm, AIE, RMIT”

In response to a question about where the studio had sourced the majority of its employees from, CEO2 offered further commentary on the topic:

“That depends on the year. Through the 80s, no qualifications. During the 90s, 50% qualified and 50% non-qualified. You hit 2000, 75% are grads. Of the 25% that aren’t almost all of those would be art. Even with those artists, they’d have gone to AIE, Qantm – on Qantm.... So most of the artists would have come through the same post grad or equivalent course. They’d have done some sort of diploma, degree, and be finished/game ready with AIE or similar.

Programmers here, I’d say 80% of them have degrees. CompSci. 20% are old-school and have done because they’ve always done it sort of thing.”

The suggested 75% of developers from the year 2000 and beyond possessing a qualification is consistent with the survey results; approximately 79% of respondents possess one or more qualifications. The remaining 21% who did not possess a qualification were all either senior (>6 years) or mid-range (3-6 years) experience-wise.

The trend described by CEO2 of qualified vs non-qualified developers is consistent with the survey results and suggests a qualified applicant is preferable to an unqualified applicant. The results suggest a strong relationship between the period of time a developer has been employed and their qualification type (p < 0.05). Artists are referred to as constituting the majority of the 25% that are not qualified, though the typical path for a games artist is identified as a generic art qualification supplemented with a GDE specific qualification (typically from a private institution).

Aside from qualification type, of value is the means by which student develop their interpersonal skills in a game development specific context. Literature on GDE suggests game development should be a collaborative experience (Parberry et al., 2005, p. 92) (Sturtevant et al., 2008, p. 383). Comments on the value of experience in a collaborative environment were offered by CEO2 in response to a question about specialisation versus generalisation (such as a GDE course or focus versus a CS course).
“Because of the nature of game dev at our end, you’re typically going to be part of a team of 30-40 and you’ve got to be able to interface with artists, producers, designers, and the ability to converse with them on any level whatsoever requires what you’re just talking about, that they must have a broader knowledge”

This is consistent with published literature and emphasises the value of interdisciplinary and collaborative components in a course that might produce potential game developers. That ‘broader knowledge’ would ideally be acquired in a dedicated GDE course where exposure to the game development process and interdisciplinary collaboration can be facilitated more easily than in a generic CS or art course. Section 5.4.2: Skills expands on the value of interdisciplinary collaboration further; in the context of this theme, that collaborative experience is clearly valued as a component of a prospective developer’s educational background.

**Theme summary**

The above comments deal largely with qualification types and the distinction between GDE-specific and generic qualifications. A summary of the points raised through discussion of interview and survey data is as follows.

1. Generic qualifications are preferred to GDE specific qualifications in most cases, despite the specialisation offered by a GDE course
2. Developers (particularly at senior level) express concern about the perception utility of GDE qualifications outside the games industry; a GDE qualification is potentially damaging to graduate job prospects either within the games industry or in the broader IT industry.
3. Graduates applying for technical roles at a game development studio should possess a qualification of some kind, preferably a generic CS qualification.
4. Artists are more likely to come from a GDE specific educational background via private institutions.
5. A GDE qualification combined with a generic qualification may be advantageous to graduates
6. Broad knowledge of the development process and experience in a collaborative interdisciplinary environment are of value to industry.
This section discusses the collected qualitative and quantitative data that details the type of educational background an Australian game developer might possess. This theme was largely concerned with preferred developer qualifications and links directly to the next theme; skills.

5.4.2 Skills

This theme leads directly from Section 5.4.1 and explores the preferred skillset of an Australian game development graduate. This theme is central to determining the preferred educational background of a graduate. Interviewees and survey respondents alike were asked direct questions about which skills they deemed to be of value in the games industry. Survey respondents tended to offer skills relevant to their own discipline along with more broadly applicable interpersonal skills. The interviewees offered a higher level view of the skills they sought in an applicant.

Skills overview

CEO1 provided an overview of the skills he required applicants (graduates or otherwise) to possess in response to the question “(List) two to five skills a programmer should possess regardless of the specific position. Two to three skills you would always look for. Soft skills or otherwise”:

“Someone with a team focus is pretty important. (Write) code with a view that others will work on their code. Fair bit of stock (placed) in that. Technically smart, mathematically smart, there’s a strong linkage to that. Also, our studio looks for people who show a bit of design flair. There is a skill to programming gameplay and there are techniques that come up over and over again and people who have made interesting or fun games, even if they’re very simple, if they can demonstrate those concepts that goes a long way at our studio. As far as technical skills I think those are the three main ones. As well as that, work ethic, how professional they are, that can be hugely compelling. Anything else can be worked around.”

These comments appear to be largely from a largely technical perspective, but also provide some views on more generic skills such as teamwork (from a programming
perspective) and professionalism. As raised late in the previous theme discussion, the ability to collaborate in an interdisciplinary environment is important to employers (“...someone with a team focus is pretty important”). Survey respondents were asked to provide an answer to the question “Regardless of your educational background or current role, which 3 skills (soft or technical) would you regard as vital for aspiring student developers?”

Responses to the question were qualitative and results were tabulated in Tables 4.18 to 4.21 (Chapter 4: Results, Section 4.2.5). Table 4.18 lists those skills termed generic; interpersonal skills, work ethic, general development process knowledge and so on. ‘Teamwork’ constituted 32% of responses deemed to fit into the generic category. ‘Communication’ constituted a further 33%. These two skills far outweighed other skills mentioned by respondents. Eight percent (8%) of respondents also listed ‘interdisciplinary knowledge’ as a skill, which links directly to the notion of interdisciplinary collaboration.

**Interdisciplinary collaboration**

CEO2 crystallises the issue of teamwork and the value of interdisciplinary collaboration:

“You’ve got to get the artists and the programmers together. One of the reasons I supply lunch every day and do it via the intranet where you order your lunch and all that – one of the reasons I do it is because if you have lunch with people, you typically have to talk to them... That’s one of the things that is great, seeing people converse across different disciplines. It doesn’t happen enough. A lot of companies where the artists hate the programmers and vice versa; it’s just like that.”

CEO2 continues:

“When 40 people have to get together, any one of those guys can derail it. You’ve got to know the other disciplines, you’ve got to be approachable, you’ve got to be able to speak to people. It’s a Yin Yang; if you’re very very very good at coding, typically your personal skills aren’t so great, it just seems to go together.”
David Hibbeln of BioWare expressed a similar sentiment:

“It is one thing to just train students to have a set of skills, but it is much more important to train them to use those skills within the context of an interdisciplinary project. The ability to harmonise with a group is one of the most important employee skills when working for a company such as ours.”

(Sturtevant et al., 2008)

As evidence by the reviewed GDE literature, the notion of interdisciplinary collaboration in game development is not new. It is considered an important component of a developer’s skillset to be able to work with exponents of disciplines besides their own. CEO’s comment (“if you’re very very very good at coding, typically your personal skills aren’t so great, it just seems to go together.”) highlights the importance of improving the interpersonal skills of programmers in particular and he expands on that point:

“If I have a gun programmer here that is a gun, really awesome, and anything I want him to write, he can write. As long as I put it in the right language he can do it. But he can’t interface with people. Or, I have a guy who is a 70-80% code level but can interface with people, he’s the guy I want. I don’t want the lone wolf.”

GDE courses should therefore, ideally, offer a specialised game development environment in which students can apply their domain specific skills to team based projects in order to develop interpersonal skills. Domain specific interpersonal skills such as interdisciplinary communication and an understanding of the broader development process (beyond one’s own particular sub-domain, such as network programming) should ideally be attained in a collaborative environment. In response to the question **Do you prefer working as part of a group or individually?** 43% of students preferred group work while 28% preferred working alone (29% declared no preference) (see Chapter 4: Results, Section 4.3.3, Figure 4.22). According to the above comments, this attitude to collaboration would require adjustment in order to improve the employability of said students.
The gap between studios

Given the rise of independent developers both globally (Irwin, 2008) and locally (Pink, 2013), the gap between the larger studios and the smaller independents in terms of collaborative skills is expressed by CEO2:

“When you get down to the other end of the scale with iPhone and iPad and so on... there are chances you’re going to have to fill the gap. At our end it’s great for them to have (collaborative experience) so they know how to converse with the other guys and keep things on track. At the other end, where most of the work down the track is going to be, it’s absolutely essential that they understand different disciplines. Chances are they’re going to be young and not know that they need to know those disciplines, but they do.”

The Film, Television and Digital Games report released by the ABS in June of 2013 reveals an increase in the number of active Australian studios (45 to 84) and a drop in developer numbers (1,431 to 581) (Pink, 2013). This lowers the average number of developers per studio from 32 to 7. CEO2 notes that most of work done by Australian developers will be done by these smaller independent teams; this assertion is supported by the available figures. The above comments suggest the value placed on broad development knowledge and collaborative experience by industry in general is amplified in smaller independent teams and the figures suggest an increase in that type of studio.

Skills over qualifications

When asked to choose between two applicants, one that is highly skilled but unqualified and one that is less skilled but qualified, CEO1 responded:

“The person with the skills, for sure.”

This suggests that, ultimately, technical skills are the most valued commodity (though not at the expense of interpersonal skills), irrespective of an applicant being qualified or not. As evidenced by the responses in the previous theme however, the
majority of applicants will likely possess a qualification of some sort anyway so the point may be moot. A follow-up question (“Does a high standard of skill override a lower but more game specific skill set?”) saw the following response from CEO1:

“I don’t think it overrides it necessarily, it depends on what that difference is. If we determine that there’s a fundamental problem with someone’s programming ability or a glass ceiling that’s just not high enough then that discounts them immediately. If one guy happens to be slightly better but doesn’t have those game development skills, we’ll defer to the guy that has game development skills if the gap isn’t too great.”

CEO1 continues:

“(on being familiar with the development process) I think it’s hugely advantageous and that’s why we prefer to hire from within industry than university; if they’ve got an understanding of the game game dev process, that’s great. As I said, if they had taken a CS course that had a lot of game dev-esque subjects then that would be a much more compelling proposition.”

This reiterates the original point that skills are first priority, but the further comments echo those of CEO2 in that game development skills are of value to industry if the skills gap is negligible. Given the low number of survey respondents who possess a GDE-specific degree and combined with comments from interviewees, the skills gap between GDE graduates and generic graduates is, broadly, too large for the above scenario to be applicable. Regardless, it would seem logical that the best option for students to acquire these domain specific skills would be in a dedicated GDE course (assuming their discipline specific skills are at the required standard). A survey respondent offered a few general observations about game development skills:

“I find that a lot of game design students seem to lack general life skills or the professional commitment and conduct to work in an office environment. It would be great to be able to prepare younger students to be able to apply to work professionally and conduct themselves as expected in a company. Even though a lot of our work is casual and very relaxed, it is good to enter the workplace like this and then adapt accordingly.”
This observation is difficult to quantify, but suggests a need for an improved preparatory phase during a student’s education. The question of whether game design and development as a career attracts a certain type of personality, or whether those students who make the shift from player to creator tend to misunderstand the reality of game development is unclear from the collected data. However, the need for professionalism is a constant in any industry and the foundations of that professionalism should be developed at the tertiary level (GDE-specific or otherwise).

**Project management**

CEO₂ comments on the value of time management during further skills discussion:

“(for programmers) Great time management. Being able to predict how long it will take them to do something. Unfortunately, that’s not normally going to be with a grad and it takes a long time to double and triple what you think how long it will take. The 80/20 rule (80% of the work is done in the first 20% of the available time). The other thing they really need is personal skills.”

The need for personal skills is reiterated here, coupled with a need to manage time allocation effectively. CEO₂ comments further in the importance of managing time:

“Treat every single piece of work that you have as a project. There should almost be a project plan with everything that they hand in. Even on the small scale.”

Regardless of the means by which students of each discipline learn their respective game development skills, the application of those skills should, as in the games industry, be treated as a project according to CEO².
Software and technology

The question of which software and technology to use in a games course is raised by CEO1:

“...tech and middleware is a difficult thing as well. I notice unis like to train students in different middleware which I think is a good idea, but I also think it’s difficult because 10 years ago you’d be training someone in Renderware and Renderware’s not even on the map any more. These days you’re probably training people on Unity, or Unreal. I think Unity is actually a good way to go at the moment. If I was doing a course I’d consider using that. I still think it’s important for students to be trained in C++, maybe some exposure C# and Javascript.”

“...there are jobs that require Unity experience or Unreal experience and it’s more likely to be Unity in smaller Australian studios. That said, traditionally though there has been resistance to using middleware in Australia. Maybe it’s not that important for getting jobs in Australia”

This comment highlights the difficulty and uncertainty in identifying appropriate software and technology with which to train students as part of a GDE focused course. The turnover of technology like Renderware highlights the fluidity and pace of the game development industry. As highlighted by CEO2 in Section 5.4.1, tertiary institutions (universities in particular) are perceived as being slow to adapt and struggle to keep pace with the games industry where current technology is concerned. However, CEO1 raises the point that knowledge of fundamental programming languages such as C++ are still important for prospective developers.

These foundational elements are constant and consistently relevant. CEO1 mentions Unity as a possible middleware choice for smaller Australian studios, but then identifies a resistance to middleware and questions the value of learning specific middleware for graduates. However, this resistance may be lessened due to the recent increase in small studios. It would appear that the state of the industry partially dictates fluctuations in the choice of technology being used by studios; this is pertinent for GDE focused courses. Some comments from both survey respondents and interviewees raised specifically technical skills they considered important:
CEO1:

“Things like object and entity systems, the way they are generated and the lifetimes of those systems; AI, and even though people get pretty novel with AI, there’s a still a basic finite state machine based AI and in the vast majority of games, that’s what they’ll be using”

A survey respondent:

“These days people have an advantage if they have a core programming or art skill that they are good at. This will enable them to get in to the industry, then they can grow from there.”

And CEO2:

“The coding standard for a games grad is not as high as that for a pure compsci grad. But, we get them there. We have strict coding standards and that makes it a lot easier... Coding standards are big and that’s probably something unis could do, look at coding standards, talk to my guys here, so they can say ‘Here are the coding standards we use, and we will not accept breaking them’”

CEO1’s comment about AI and the common AI approach is consistent with earlier comments from CEO1 regarding foundational programming languages. CEO2’s comment about coding standards highlights the importance of coding standards within his particular studio and it’s reasonable to generalise that importance to other studios. Of interest is the portion of the comment that marks GDE graduate programmers as less capable or less rigorous than programmers of a Computer Science background. It marks GDE graduates as less adept technically. It also emphasises the value of rigour (at least for programmers). A developed ‘core’ skill (typically art or programming based) is a commonly accepted means for graduates to gain entry to the games industry. Design roles are less common at entry level, but design is a desirable role for students seeking a game development career. This issue is explored specifically by respondents:

CEO1:

“You can’t say ‘I want to be a designer and I’m not going to do any scripting, I’m just going to write something down on a piece of paper and this is how the
mechanics of the game is going to work’, and if you’re expecting that to translate into a compelling document, a compelling game, then you’re way off. I’ve seen designers do this in studios I’ve worked at in the past; they don’t have grounding in programming, they’ve never made their own games and therefore they don’t understand the process. They don’t understand what they need to do to make a fun experience.”

A survey respondent:

“Anybody that tells me they want to be a designer I’ll usually tell them that a broad understanding of nearly every aspect of games development is required”

And CEO1 again:

“...we don’t hire specialist game designers either”

“You have to have gone through that process where you’ve created a game, put it in front of someone, found out what they like, what they don’t like, take it back, modify and give it to them again. Unless you’ve done that literally dozens of times with different types of games, you’re not a good designer and you never will be.”

Designers

These comments mark the design role as one requiring a broad understanding of the development process, but also experience in the creation of games on a practical level. CEO1 suggests that designers must have programming experience in order to implement their own designs. The role of specialist designer is typically regarded as a senior role for the above reasons. The survey respondent’s comment regarding core skills is refers to a path into industry, specifically that graduates must first attain a position via either the programming or art routes (QA is also a potential path to game development with an existing company but is not deemed applicable in an education context). Students seeking a design role seem unlikely to find such a role at entry level. Of the ten industry survey respondents who listed design as their role (Chapter 4: Results, Section 4.2.3, Table 4.12), only one listed their role as ‘junior designer’.
Figure 6.3 in Chapter 4: Results (Section 4.3.2) shows students preferred roles compared to roles listed by industry survey respondents. Seventeen percent (17%) of industry respondents identified as designers while 26% of students listed designer as their preferred role. While this is a relatively small discrepancy, few of the industry survey respondents who listed design as their role were dedicated designers. Seven of the ten industry survey respondents who listed designer as their role also listed other roles (programmer/designer/marketing for example). This is consistent with the shift toward smaller development teams and consistent with comments made by CEO2 (“At the other end, where most of the work down the track is going to be, it’s absolutely essential that they understand different disciplines.”). This shift likely precludes students as specialist designers, indicated by the aforementioned single junior designer. While design is undoubtedly a valid component of any GDE course or major, it seems unlikely to be a valid path for students seeking a point of ingress to a career in game development with an existing studio.

Theme summary

The skills required by industry range from the technical to the interpersonal. Interdisciplinary collaboration and experience of the game development process are highly valued and in the case of CEO1 is cause for their hiring process focusing almost exclusively on experienced developers. The importance of communication is emphasised by CEO2 (“…if you’re very very very good at coding, typically your personal skills aren’t so great, it just seems to go together” “You’ve got to get the artists and the programmers together”). Technical skills such as programming and 3D modelling be taught to students of any GDE focused course, but it is through the application of those skills that interdisciplinary collaboration and the game development process are experienced by students.

The following is a summary of the points drawn from this section:

1. Interdisciplinary communication skills are key - programmers and artists must learn to collaborate
2. Knowledge of other disciplines is important, particularly so in smaller studios at the lower/independent end.

3. The turnover of software used in tertiary GDE focused courses hampers the capacity for courses to remain current and relevant, but the foundational elements (C++, finite state machines for AI) remain constant and can be reliably utilised in course content.

4. Technical skills are important, but not at the expense of a broad understanding of the development process and the ability to work in a team.

5. Designers should ideally have programming skill so that they can create and test their designs. Design roles are likely to be fulfilled by experienced developers and as such are probably unsuitable for graduates.

Defining a developer’s preferred skillset highlights the key components that a GDE course should contain (if producing graduate game developers is the course aim). Beyond graduate game development competency is the need to determine if graduates, appropriately equipped or not, will have an adequate opportunity find employment in the Australian games industry. The following section explores graduate opportunities and discusses the limiting factors that might obstruct a graduate’s attempt to seek a game development career in Australia.

### 5.4.3 Graduate Opportunities

Graduates and graduate opportunities are arguably the common point of interface between education, industry and students and represent an important component of this research. The data discussed in this section was largely collected from interviewees (one comment from the industry survey was used). This theme arose from analysis of the collected data. Interviewees raised several issues that hamper graduate opportunities in Australia and reflected on the need (or lack of need) for graduates over time. The changing nature of the industry, specifically a shift away from large studios and the subsequent impact on graduate opportunities, is also discussed. CEO1 comments on the state of the employment market:
“They (grads) immediately fall behind anyone with a couple of years’ experience and that’s the case at the moment, that there are quite a few people out there with experience. Grads are right at the back of the queue.”

“…these days there is so much talent out there, we don’t need to go to the unis, in the past we have hired guys straight out of college or near enough, not at the moment and we don’t hire specialist game designers either.”

“There’s a huge outpouring of grads going into an ocean full of experienced developers who have worked at high quality studios. We get applications daily and as soon as you see an application for a graduate fresh out of uni you think ‘You poor guy, there’s almost no chance of getting a job in game development’ and I don’t think there’s a change on the horizon in that.”

These comments refer to a healthy supply of experienced developers applying for positions. Major studio closures in Australia (Krome, Pandemic, Transmission Games, BlueTongue and Team Bondi to name several (Miller, 2011)) resulted in a significant number of developers seeking employment with remaining studios or beginning their own. The oversupply of experienced developers, as indicated by CEO1, severely limits graduate opportunities. The reduction in developer numbers as of June 2013 from 1,431 to 581 (Pink, 2013) serves to further diminish graduate opportunities. Clearly, graduates cannot compete with experienced developers when seeking employment and as CEO1 asserts, that situation does not seem likely to change in the near future.

The criteria by which job applicants are assessed were raised in discussion with interviewees and were also raised by a survey respondent. The survey respondent (a senior developer) reflected on the hiring process:

“In my experience in hiring staff members across a number of companies and disciplines, the way in which I went about it was a first pass on whether the applicant could do the work, by checking their art folio/code examples/designs. If these were up to scratch (roughly 10% of applicants) then they would be brought in for an interview to judge their interpersonal/professional skills. Their actual qualifications were not really taken into consideration during this process”
This statement is somewhat contradictory with earlier comments made by CEO2 in Section 5.4.3 (specifically that the majority of applicants in recent years were qualified), but is consistent with the emphasis placed on folio quality (explored further in Section 5.4.4). This is instructive for graduates in that reliance on a qualification over a competent folio will potentially limit employment opportunities. CEO2 outlines what is expected of the ideal applicant:

“The ideal applicant won’t show me everything. What they’ll do is show me what they’re good at. What grads fresh out of school tend to do is show how good they are at everything. So, I get 40%, 50%, 60% quality of all of it. What they are better off doing is showing me a masterpiece, the perfect circle. The same goes with code. Code... if they’ve done a team project at uni, it’s very hard for me to work out what they did”

Again, this comment is instructive for graduates. In much the same way as having a core skill was highlighted as a common path into industry, a specialisation within that skill domain is highlighted here as the preferred means of demonstrating competence to an employer. The comment about team projects is also instructive, suggesting that while experience in a collaborative environment is important (see Section 5.4.2), using the output from those team projects is not necessarily useful for employers trying to determine an applicant’s technical skill.

Internships or graduate programs are common in many industries, but are more likely to be found in larger companies. In the Australian games industry, internships are becoming less common as company sizes decrease. CEO1 commented on graduate programs and the issues surrounding their implementation:

“If we were a bigger, more stable company like a Commonwealth Bank or a BHP you could predict with some certainty what your revenue streams were going to be and what your employment needs are going to be you could say “Alright, we have a grad program for 5 or 10 grads every year/couple of years”. Then, you would be concerned about getting the right kind of people in. That’s so far from where we’re at and game dev in general is going through such transition with Facebook, app stores and so on.”
CEO₁’s comments indicate uncertainty about the future, characterised by the shifting nature of development platforms such as Facebook and the App Store. CEO₁ also indicates where game development is heading more broadly and marks that as his focus, rather than finding and employing new talent. The shift from large companies to small and commercial studios to independent is perhaps too volatile an environment for a structured graduate program, particularly for the smaller studios. CEO₁ continues:

“(on taking on interns) If we were bigger and had a better handle or certainty about our revenue stream yeah, definitely. The Film Vic program (referring to funding for studios to take on an intern) is compelling and we’ve been criticised in the past for not taking that up because of the financial incentives, but the reason we don’t is we feel we’d be short-changing the intern at the moment. We’d be doing it because we could get someone for cheap labour for 6 months and at the end of 6 months we’d be giving them the flick. There’d be no legitimate opportunity for them beyond that at the moment with us. So the financial means it makes sense to take it on but I don’t think it’s an ethical way to go about it for us.”

“There are studios who use interns through different programs to fill those different roles and the intern won’t necessarily get a job at the end of it.”

CEO₁ mentions possibly short-changing interns in the long term, despite the attractive funding available to studios that accept interns. His comments suggest that the need for graduates is simply not a factor for his studio at this point. His mention of ethical concerns reinforces the concern showed by respondents in Section 5.4.2, specifically that GDE graduates are disadvantaged compared to those with generic qualifications. Concern in general about graduates and graduate opportunities suggests that studios would take graduates through internship programs if possible, but this is precluded by the current state of the industry.

The issues raised by CEO₁ are conceivably common to other smaller studios and the shift to smaller independent studios likely reduces the prospects of internships even further. Figure 4.14 (Chapter 4: Results, Section 4.3.2) shows the percentage of student survey respondents who would or would not apply for a graduate position or internship if such a position was available. Unsurprisingly, 89% of respondents would choose to
apply for such a position. In contrast, Figure 4.4 (Chapter 4: Results, Section 4.2.2) shows the percentage of industry survey respondents who had completed an internship or similar program; 87% of respondents had not completed an internship program.

The idea suggested by CEO1 in Section 5.3.2 offers a possible means of providing students with the benefit of game development experience through mentoring while minimising the obligations of developers. This or a similar kind of program, one that allows students to interact with developers and contribute to a meaningful project without actually being employed by developers as an intern, might fill that void. As raised by CEO1, the funding incentive offered by Film Victoria (Film Victoria, 2012) is a factor in choosing whether or not to offer an internship, but it is not the only factor.

When considering the viability of an intern position or positions, removing any financial barriers is not necessarily going to make graduate positions more attractive to developers. As suggested by CEO1, other studios may use interns as ‘cheap labour’ until their usefulness has expired. While graduates will gain experience during this period, such a practice once again leaves the graduate behind more experienced developers. CEO2 comments on his studio’s approach to internships:

“We do, via Film Victoria. We did 5 last year.”

CEO2’s studio is larger than that of CEO1 and therefore more likely to be capable of hosting a graduate or graduates. Studios, given a certain size, are evidently interested in offering positions to graduates as one would expect; any industry needs fresh talent. Given the figures from survey respondents and comments from CEO1 however, CEO2’s propensity to offer graduate positions appear to be a rarity.

As stated previously, graduates cannot compete with experienced developers and, evidently, there are a significant number of experienced developers applying for positions. Therefore, graduates may need a means of gaining industry experience in a way that studios can accommodate more easily than standard internship positions. This scenario differs from the scenario faced by industry (and graduates) earlier in the last decade, as explained by CEO1:

“Then 2006 and 2007 happened and people started hiring like crazy and all these games courses started and these specialist unis started that just focused on
game dev (AIE, Qantm). Then you had this crazy situation where students are getting hired halfway through their course from AIE and were paying out the remainder of their course and all this bizarre stuff that just drove this massively artificial demand for talent. As a result, even more unis started offering courses and AIE and Qantm ramped up even more and then the crash happened, and now we're in a situation where it's not going to go back to anywhere near where it was.”

Of significance is the final comment; large studios mean a greater likelihood of employment for graduates and as noted by CEO1, that phase is likely over (at least for the foreseeable future). The above comments also suggest that during the period described (2006 to 2007), a skills shortage drove developers to take on graduate (or even pre-graduate) talent at an artificially accelerated rate. Prior to the aforementioned crash, numerous large studios were operating in Australia but since 2009, many of the bigger Australian studios have closed (Miller, 2011). Australian studios derived a significant proportion of their revenue through provision of production services to international publishers, but the rising dollar and global financial downturn saw that model become unsustainable (Haukka, 2011).

A report produced by the OECD in 2005 identified a potential skills shortage in the game development industry (Vickery and Wunsch-Vincent, 2005, p. 44). Given the studio closures from 2009 onwards (Miller, 2011), it would seem unlikely that a skills shortage would still be an issue for developers. Regardless, interviewees were questioned about whether a skills shortage existed in the current Australian games industry. CEO1 responded:

“Not any more. There hasn’t been for probably 18 months. Every big studio that goes under leaves more guys free, but then some of them are going overseas, they’ll all find a place or go to other industries. Wouldn’t describe it as a shortage.”

“I still hear people beating their chest about it (skills shortage) today from industry bodies. For us, it does not feel like an issue. It’s not one of the top 3, 5 even 10 issues on our radar. Maybe for bigger companies, but not for us.”
As indicated by CEO₁, his studio’s size may preclude it from any difficulty when seeking potential developers. CEO₂ suggests that particular areas of game development may still face shortages:

“There’s skills shortages in particular areas; the acute, low level graphics programmers are tough to find. There are not skills shortages in any of the other areas right now. Two years ago, extreme shortages, but with the demise of Krome, Pandemic... Yeah, so it’s not so hard now”

As indicated by CEO₂, the major studio closures largely solved the skills shortage issue for those studios still operating, limiting graduate opportunities. The tendency for smaller studios to seek experienced developers combined with the increase in the number of smaller studios and the abundance of experienced development talent, likely renders GDE graduates as a distinctly unappealing proposition for studios. The notion that filling employment vacancies is no longer an issue for developers is further substantiated by interviewees when questioned about the sustainability of GDE courses. CEO₁ bluntly encapsulates the situation for graduates:

“It is unsustainable and there are way, way too many grads coming out of these courses; maybe 80% of them will never find a job in game development”

CEO₂ specifies the issue:

“It’s not sustainable if everyone wants to be a console developer. If everyone wants to be a console developer, it’s not sustainable”

“Taking iPhone, Android into account, the PS Vita, then the market’s expanding and the market’s expanding at a far greater rate, than we can find graduates to fill those roles, at the bottom level. At the top level, console, we’re saturated, we’ve got too many people”

“It’s an extraordinarily expanding market at the middle and bottom end. iPhone iPad, Android, all those. That’s a fantastic opportunity, an expanding opportunity. But the pointy end, where pretty much everyone wants to be... it’s almost like saying ‘I want to be an astronaut or I want to be an actor’ – we’re starting to fall into that category.”
CEO₂’s longer term view is contrasted with CEO₁’s more immediate assessment. Evidently, console development is more difficult to reach for graduates than mobile development. The continued growth of the mobile development sector, as highlighted by CEO₂, is in that sense encouraging for graduates. The decline of console development opportunities mentioned by CEO₂ is supported by the number of console developers operating in Australia. When discussing graduate opportunities, an area that does not receive coverage equivalent to the ‘entertainment’ games sector is the serious games sector. CEO₂ offers a comment:

“If we take simulation, defence, and serious games, into account, we’re probably under-resourced if anything”

The serious games sector is difficult to explicate; it is relatively immature and not clearly linked to the entertainment games sector (Turbin et al., 2008, p. 8). This may impact on how opportunities in the serious games sector are presented to students of game development. The role of serious games in GDE courses is unclear; as mentioned, the focus tends to be on the more familiar entertainment games sector. Graduates sought for the serious games sector are just as likely to be drawn from non-GDE focused backgrounds, such as multimedia (Turbin et al., 2008, p. 8). Whether the serious games sector can be linked to GDE specific education in an effort to broaden the possible employment opportunities for graduates remains unclear. Regardless, in CEO₂’s view, the serious games sector potentially expands the available opportunities for Australian graduates seeking local employment. CEO₂ summarises his view on oversupply graduate of graduates:

“Two years ago I’d have said there’s too many courses and graduates. But forecasting down the track and as part of a connected world, the job you do here is not part of the Australian economy. The job you do here is distributed into the global economy, immediately”

The opportunities provided by the lower end of the development market (iPhone, Android) may yet rejuvenate the Australian games industry, providing graduates with employment opportunities in the future. At present however, according to respondent comments, graduates will find pursuing employment with an Australian game development studio difficult.
Theme summary

The theme of graduate opportunities is perhaps the most practically relevant theme discussed in this chapter. It explores the state of industry in relation to graduate opportunities and illustrates the difficulty in finding a means for graduates to gain industry experience. Studios are willing to take graduates in a formal manner and graduate programs do exist to facilitate exposure to industry practice, but several factors impact on a studio’s capacity (or at least studios of a certain size) to take on graduates. High availability of experienced developers limits graduate opportunity in a traditional employment sense, but even internships (which would typically be filled by graduates only) do not appeal to smaller studios as they would be unlikely to offer the graduate a full time position post-placement.

The following is a summary of the key points raised in the preceding section:

1. Following a number of large studio closures, a significant number of experienced developers returned to the employment market.
2. Graduates are competing with said developers for positions in game development studios.
3. Output from team projects is not necessarily a useful means of demonstrating an applicant’s competence; they must have completed their own personal projects to demonstrate their technical competence, or be able to clearly articulate and demonstrate the elements of a team projects completed by the applicant. Particularly relevant for programmers.
4. Internships are less common in smaller studios. Despite the financial incentives offered by funding bodies, internships or graduate positions are problematic for other reasons. Smaller studios appear to be less able to accommodate graduates in the longer term. The majority of industry survey respondents did not complete an internship.
5. There is not currently a skills shortage in the Australian games industry following the major studio closures, though CEO2 projects that the expanding bottom-end of the market (mobile platforms, digital distribution) will potentially require graduates.
6. Regarding sustainability of GDE courses, the interviewees determined that currently, graduate numbers are too high, particularly in the console development sector. However, CEO2 suggests that including the serious games sector in the equation potentially increases graduate opportunities.

Graduate opportunities are clearly limited at this point, but a graduate’s chances of employment can be improved if they are adequately prepared. As has been mentioned by both interviewees and survey respondents, a key indicator of applicant competency is the applicant’s folio. A well-developed folio is indicative of work completed outside the bounds of the course the applicant has completed (if any), meaning extra-curricular work is valued by industry. The following theme discusses the necessity of extra-curricular work for students who hope to maximise their chance to gain employment as a game developer.

5.4.4 Extra-curricular Work

Many of the themes discussed here were expected and directed by the line of questioning used in the interviews and surveys. The theme of extra-curricular work was emergent, contributed by respondents unprompted by a specific question. This theme differed from most other themes in that the issue of extra-curricular work by graduates was widely and consistently highlighted by respondents as important. Further, little variation existed in the types of comments that were contributed. Given this relative lack of variance, the following comments are grouped according to respondent (CEO1, CEO2 or industry survey respondents).

The value of extra-curricular work for graduate applicants

CEO1 expands on the method by which applicants are assessed (as discussed in Section 5.4.2):

“There’s always been a lot of stock placed in what people do outside of university. Maybe that attitude changed in some studios around 2006 and 2007 where they started hiring at a huge rate and looked at unis to meet that demand."
But, for the most part, I think people still... the traditional view has been that unis are not the silver bullet solution for someone to come in; they need to have done their own stuff and that’s a far more compelling argument to get a role.”

This comment firmly establishes the importance of extra-curricular work for applicants, seemingly of greater value than an applicant’s qualification. The comment “...they need to have done their own stuff” suggests an applicant who cannot provide material evidence of their ability (beyond coursework) is likely to be dismissed early in the assessment process. CEO1 warns against false student expectations:

“Comes down to the same thing it always has: if you’re prepared to do the work outside the set hours and have an affinity for the work you’ll be great. If you’re just going into a course and expecting to do only that and get into an entry level game development job then you’re kidding yourself.”

Respondents repeatedly emphasise the ‘out of hours’ time required of aspiring developers, suggesting that coursework alone is an inadequate means of preparation for an industry role. CEO1 continues:

“In a 3 year computing course you can’t hope to learn everything you’d need to know and if you rely on the course and do nothing outside of hours then you’d need a 4 or 5 year course that will bring them up to speed in game development. Of course that’s not viable; if we were like the mining industry and could guarantee a career and income then fine, that would work but game dev is still in its infancy and is changing month to month.”

The prospect of a five year game development course is questionable, but the suggested course length both reinforces the complexity and difficulty of game development (as raised by CEO2 in Section 5.4.1: “The hardest programming you’ll ever do is in games. There’s no doubt in my mind; I’ve done so much programming out there in different facets and games is the hardest.”) and marks courses (not necessarily GDE-specific) as inadequate preparation for a graduate (assuming they are solely reliant on their qualification). Based on respondent comment throughout this chapter, cause for this insistence on extra-curricular work is borne by exposure to a low quality of work produced by applicants whose output seemingly lacks self-directed extra-curricular content. Further, as raised by CEO2 in Section 5.4.2, team-based projects are
a problematic means of assessing an individual applicant’s competence, though students enrolled in a GDE course should, according to interview responses, typically be engaged in collaborative projects.

This then raises the question of whether opportunities to produce individual content of acceptable quality are a common component of GDE-specific courses and if not, whether such opportunities can be catered for within a course rather than outside it. The notion raised by CEO2 in Section 5.4.1, that private colleges offer a skills and content-focused environment (“So, to the point where I see the private guys as finishing schools.”) yet produce lower quality graduates than university, raises the possibility of an intensive ‘finishing school’ to round out a GDE-focused degree. A formalised means of directing the production of content that industry finds appealing (individual) might bridge the gap between the work that students produce in-course and the required standard of folio work deemed necessary by industry. CEO2’s comment in Section 5.4.3 regarding the ideal applicant is furthered here, with the emphasis on extra-curricular work as a key indicator of ability:

“It’s their folio. It’s all about what they’ve done in their own time…. the ideal applicant is someone that spends their own time, not just showing what they did at uni”

These comments are consistent with CEO1’s comments.

“So, demos. A demo they’ve done themselves, outside of uni. Uni will give them the base to be able to do those things, but outside of uni stuff is what I want to see. They still need the degree, they still need to learn the stuff, but it’s a matter of if they’ve got the fire and guts and gumption to produce outside of a course.”

These comments reinforce the value of a degree but again assert that exterior work is crucial for graduate employment prospects. The comment “it’s a matter of if they’ve got the fire and guts and gumption to produce outside of a course” suggests the value of extra-curricular work is not only the work itself, but the fact that a graduate has endeavoured to produce content in their own time. This is less tangible, but speaks of a desire to see evidence an oft quoted trait of successful game developers: passion. Furthermore, the comment “A demo they’ve done themselves” reinforces the need for
graduates to have not only worked with other students on collaborative development projects but also have completed their own personal projects, highlighted by CEO₂ as a more easily decipherable demonstration of their competence.

**Extra-curricular work as an indicator of drive**

Survey responses echoed the interview responses:

“Get a Comp.Sci. degree and do all of your game-related work outside of university.”

“If someone was doing a university degree without also doing extra-curricular projects in their chosen field, then they're not dedicated to their field and can't expect to succeed after the course is completed.”

This comment echoes in particular the comment made by CEO₂ (”fire and guts and gumption to produce”). Based on these comments, extra-curricular work serves two purposes: one, to provide evidence of technical competence and two, establishing dedication to the field through completion of self-directed projects. Contrasting this emphasis on extra-curricular work is the student perspective. Students were posed the following question as part of the student survey question:

*Do you practice game development (solo or as part of a group, e.g. mod team) outside of the course/game development units? If yes, please provide a brief description.*

Figure 4.20 (Chapter 4: Results, Section 4.3.3) shows the distribution of students who do engage in extra-curricular development and those that don’t. Approximately 55% of students stated they did not engage in such activity. Based on industry respondent comments, these students (assuming they are seeking a career in game development; 9% of respondents stated they would not) are at a significant disadvantage besides the existing barriers (competition from experienced developers for one) that are beyond their control.

Another survey respondent neatly summed up the most effective path to a game development career:
“Make games”

The following comment highlights the importance of completing a project and echoes comments made by CEO2 in Section 5.4.2: Skills (“Treat every single piece of work that you have as a project”):

“The most important thing for students interested in game development is for them to make a small project of their own and to finish the project”

Finally, a survey respondent highlighted platforms which would be suitable for student development:

“There is no reason why all students aren't releasing a game on iOS or the Android marketplace.”

Opportunities exist for student to not only create content, but potentially publish and promote it within the bounds of a course. Affording students these opportunities might assist in addressing the need for larger student numbers to have produced competent personal folios.

Theme summary

The above comments feature a thematic consistency, that being extra-curricular work (in the form of a demo for example) is essential for students hoping to gain employment in the Australian games industry. This theme could be viewed as a subset of the previous theme since, according to the above responses, a key attribute of successful graduates (if success is measured by achieving employment in a games studio) is their capacity to complete their own projects outside of allotted course time and assignments.

The following points summarise the key issues raised in this section:

1. Extra-curricular work is used a key indicator of a graduate applicant’s technical competence.
2. According to industry respondents, coursework alone is an inadequate predictor of success; graduates should not rely solely on their qualification nor the work completed within a course if they wish to successfully apply for a development role.
3. Extra-curricular work not only demonstrates a graduate applicant’s technical competence, but also their drive, application, passion for the medium and capacity to complete a self-directed project.

The importance of extra-curricular work raises the question of whether GDE courses should incorporate self-directed projects as a supplement to a more collaboration-focused pedagogy. While the value of collaboration is asserted through literature and throughout this chapter, the output from collaborative projects is not necessarily suited as folio content. Small teams (e.g. one programmer and one artist) are easier to divide in terms of contributions, but larger teams present problems for developers when trying to determine which elements the graduate applicant is responsible for. Besides this, self-directed projects demonstrate dedication to the craft in the eyes of developers. Incorporating the values (both perceived and tangible) that extra-curricular work is seen to embody warrants consideration for educators when developing a GDE course structure.

5.4.5 Summary

The question of a preferred educational background for GDE graduates (those being graduates who have attained a qualification that features a GDE focus) is multi-faceted. The phrase ‘educational background’ does not merely imply which qualification a graduate should possess, but encapsulates a holistic view of a graduate’s complete educational experience. The preceding sections detail industry’s preferences for how a graduate should interact, skills a graduate should possess, the type of qualification they should have attained and the way in which a graduate should demonstrate their technical competence.

A short answer to the question ‘What is the preferred educational background of an average graduate seeking a game development career?’ is as follows: graduates should have completed a generic computer science (for programmers) or traditional arts/media degree (for artists), supplemented with a number of game related electives. If graduates have completed a dedicated GDE qualification at a private college, it will ideally be as a specialised adjunct to a computer science or arts degree. Graduates should have engaged in collaborative development with other student developers,
preferably including those from outside their own discipline. Graduates should have completed self-directed game development projects as a means of demonstrating their technical competence and commitment to the craft aside from the ability to work within an interdisciplinary team.

Aside from this answer, considerations external to individual graduates must be taken into account by educators. Industry respondent comments indicate that, primarily, the presence of an experienced cluster of developers in the employment market greatly hampers graduate prospects. Secondarily, a shift toward a more independent model means the creation of smaller companies (and teams) and greater utility among developers. As a result, internship availability will potentially drop further in the short term, limiting opportunities for graduates to gain experience in and exposure to the local industry.

The following is a summary of the key findings from each theme:

**Developer education:**

1. Generic qualifications are preferred to GDE specific qualifications in most cases, despite the specialisation offered by a GDE course
2. Developers (particularly at senior level) express concern about the perception utility of GDE qualifications outside the games industry; a GDE qualification is potentially damaging to graduate job prospects either within the games industry or in the broader IT industry.
3. Graduates applying for technical roles at a game development studio should possess a qualification of some kind, preferably a generic CS qualification.
4. Artists are more likely to come from a GDE specific educational background via private institutions.
5. A GDE qualification combined with a generic qualification may be advantageous to graduates
6. Broad knowledge of the development process and experience in a collaborative interdisciplinary environment are of value to industry.
Skills:

1. Interdisciplinary communication skills are key - programmers and artists must learn to collaborate and communicate.
2. Knowledge of other disciplines is important, particularly so in smaller studios at the lower/independent end.
3. The turnover of software used in tertiary GDE focused courses hampers the capacity for courses to remain current and relevant, but the foundational elements (C++, finite state machines for AI) remain constant and can be reliably utilised in course content.
4. Technical skill is important, but not at the expense of a broad understanding of the development process and the ability to work in a team.
5. Designers should ideally have programming skill so that they can create and test their designs. Such roles are likely to be fulfilled by experienced developers and as such are largely unsuitable for graduates.

Graduate opportunities:

1. Following a number of large studio closures, a significant number of experienced developers returned to the employment market.
2. Graduates are competing with said developers for positions in game development studios.
3. Output from team projects is not necessarily a useful means of demonstrating an applicant’s competence; they must have completed their own personal projects to demonstrate their technical competence, or be able to clearly articulate and demonstrate the elements of a team projects completed by the applicant. Particularly relevant for programmers.
4. Internships are less common in smaller studios. Despite the financial incentives offered by funding bodies, internships or graduate positions are problematic for other reasons. Smaller studios appear to be less able to accommodate graduates in the longer term. The majority of industry survey respondents did not complete an internship.
5. There is not currently a skills shortage in the Australian games industry following the major studio closures, though CEO2 projects that the expanding
bottom-end of the market (mobile platforms, digital distribution) will potentially require graduates.

6. Regarding sustainability of GDE courses, the interviewees determined that currently, graduate numbers are too high, particularly in the console development sector. However, CEO3 suggests that including the serious games sector in the equation potentially increases graduate opportunities.

**Extra-curricular work:**

1. Extra-curricular work is used a key indicator of a graduate applicant’s technical competence.
2. Coursework alone is an inadequate predictor of success; graduates should not rely solely on their qualification nor the work completed within a course.
3. Extra-curricular work not only demonstrates a graduate applicant’s technical competence, but also their drive, application, passion for the medium and capacity to complete a self-directed project.

The outlook for graduates hoping to find employment in the games industry is arguably poor; they are competing with experienced developers and are seemingly at a further disadvantage if they have completed a GDE specific qualification over a Computer Science or Arts qualification.

The state of the Australian games industry is fluid; studio closures and new development platforms with low entry-cost barriers such as the iPhone have transformed the industry; once dominated by large studios, it is now largely composed of a smaller but more diverse collection of largely independent studios with only a handful of larger studios left. It remains to be seen whether the progression of the Australian games industry is compatible with GDE courses in their current state. Regardless, tertiary institutions must adjust to suit the shifting game development landscape and develop new methods and course structures to ensure that GDE courses, if they remain a valid proposition, are relevant to the local games industry.

The following question (*How can education meet the needs of the Australian games industry in the future?*) and related themes are concerned with the future of the local industry and the shift toward an independent studio model.
5.5 How Can Education Meet the Needs of the Australian Games Industry in the Future?

5.5.1 Industry in the Present

The following comments are derived solely from interviews. Interviewees were asked directly about the state of the Australian industry in the past and present. Key topics that emerge from the following comments are as follows:

- A need for an increased business focus for the industry;
- The decline of the outsourced or work-for-hire model adopted by many Australian studios in the last decade, and;
- The increasing need to attract investment for the production of original content.

The Current State of Industry

CEO1 characterised the ongoing relevance of education from the industry perspective:

“I guess I have traditionally looked at education and game development as training people to be ready for game dev and I don’t think that’s the stage we’re at in game dev any more in Australia, I think that’s not a high priority for studios. We’re not in the situation where a fundamental problem we have is hiring quality staff, or even worrying about the quality of graduates. That’s not where the industry is at in my opinion. The next step is how we make a sustainable business out of making original games and where investment is going to come from”

This comment highlights the assertion that studios are not prioritising education due to the fact that there are enough experienced developers available when hiring. This comment links to comments made in Sections 5.2.1 and 5.3.1. Developers are willing to interact with education and assist in improving the quality of graduates applying for industry positions, but unless the impetus to do so (such as a skills
shortage) exists, studios will understandably prioritise other issues. These issues are largely financial as raised by CEO₁ (“The next step is how we make a sustainable business out of making original games and where investment is going to come from”) and detailed by CEO₁ and CEO₂ in the following comments.

The Business of Games

CEO₂ highlights the shift of focus within industry circles to discussion of business strategies rather than the development process:

“Fundamentally, [industry conference] focused on money; how do you make money, what money is out there or isn’t there, where do you go to start, how do you start, how do you make money – we need to be fiscally responsible with these guys when they leave university.”

The notion of fiscal responsibility and its relevance to graduates is further explored in the following theme, Section 5.5.2. CEO₂ continues:

“They’ve (graduates) got the dream, they want to make a game, you know how it works, but we need to be responsible and show them how not to get ripped off, we need to show them how to make sure they can pay their mortgage or their rent and eat. The other stuff, they can go to GDC to do that, they can go to the States... there are plenty of places to go to learn your craft.”

These comments indicate a decisive move to improve the business of game development in Australia and to ensure that new graduates are aware of the business and management aspects of game development. This comment also reinforces industry’s willingness to support graduates in some form. Further, it implies that graduates will endeavour to produce their own games, presumably within their own start-up studios. The above comment “show them how not to get ripped off” suggests a duty of care for existing industry regarding new development studios. Education must share in this duty of care to ensure graduates are adequately equipped with the necessary skills to produce games, but also an awareness of the realities of a sustainable commercial studio (however small).
There are very few places to learn about the financial dynamics of the industry so that’s why we focus on it. It’d be an awesome idea for them to understand the chain, even just to understand what a retailer is, what a wholesaler is, what a publisher is. So they can understand when $110 is paid for a game, how much does the developer get at the end of the day? What does it mean, is it sustainable? They’ll all be able to use spreadsheets, so you’ve got to get them to understand the financials. It also means that when they become an employee here or elsewhere, they understand the financial constraints so they don’t just think, ‘oh $110 a game, x number of units, place is rolling in cash!’”

CEO₂ raises a gap in the body of knowledge related to game development, specifically the need to “learn about the financial dynamics of the industry”. Educating the next generation of developers about the business of game development is obvious of some importance, particularly given the shift toward a more independent studio model, thus raising the prospect of an increased focus on the business of game development within tertiary GDE-focused courses. This and preceding comments highlight a need to address game development in an educational setting beyond the development process itself. Broadening the context to include elements such as business and marketing alongside the established unit types, topics and content is marked as a necessary step in the evolution of GDE education. CEO₂ cites business focus as the causal factor for their continued existence in the face of an industry downturn:

“That’s where it all starts or fails. [studio] is here, whereas everyone else has pretty much gone. It’s because of focusing on business, not just selling games, ‘If we make good games we’ll do well!’”

This comment further supports the need to consider game development holistically; evidently, making an ‘objectively good’ game (or product of any kind) is insufficient if a sustainable business is the goal. Incorporating coverage of business and marketing content into GDE courses would be the responsible thing to do according to CEO₂.
Investment

CEO1 comments on the need for greater investment from private enterprise:

“I don’t see a massive growth in the number of people in the industry, not in Australia at least. Unless, some mechanism can be found for a greater level of investment in game development, specifically in projects. Maybe in some way related to the way that film works, where investment companies are happy to put funding into a film project.”

This view is supported by the ABS report released in June which revealed a distinct drop in developer numbers (Pink, 2013). The need for investment is arguably beyond the scope of tertiary institution involvement; the following comments from CEO1 corroborate this assumption:

“The next step is how we make a sustainable business out of making original games and where investment is going to come from. It doesn’t immediately spring to mind how education can assist, not unless they want to cut us a cheque for 10 million bucks.”

Earlier suggestions from participants, notably CEO1, raised possible methods by which tertiary institutions could interact with industry in a mutually beneficial manner, but these were related to student involvement. Given the suggested focus is attracting investment rather than attracting skilled developers, it is difficult to identify how educators can contribute. This issue appears to be a solely industry-based issue and, as noted above, beyond the scope of tertiary education involvement. CEO1 identifies a specific issue within the industry where investment is concerned:

“...we also need studios to get more comfortable with how they are going to present themselves to investors; that is something developers have not done in the past and are not equipped for. They need to figure out how to phrase their products in such a way that investors will want to buy them and how to present their staff as a compelling proposition.”

The maturity of the Australian games industry is relevant here; only in the last 15 years have Australian developers emerged in a global sense and the industry is still
developing. Given the upheaval experienced in recent years (Miller, 2011) (Pink, 2013) and the decline of the work for hire model (explored further in this section), new business models, such as attracting funding from private investors, are evidently being explored by studios. Again, the role of education in this context is difficult to define, but earlier comments discussing the value of business and marketing skills in graduates may indicate at least one method education can aid industry to bridge that knowledge gap.

For GDE courses to remain relevant, they must not only ensure currency of techniques, technology and course structure, but also provide a solid grounding in the non-development aspects. The graduate of the future may need grounding in business, marketing and communication in support of, if not commensurate with, the more commonly accepted suite of technical skills.

**Work for hire**

A significant contributing factor to the closure of several large Australian studios was the decline in viability of the work for hire model (Parker, 2011b). While the work for hire model contributed significantly to the growth of Australia’s game development industry, economic factors Australia far less attractive as an outsourcing hot-spot (Parker, 2011b) (Miller, 2011). Both interviewees commented at length on the work for hire model and the shift toward original IP as a necessity to remain sustainable.

CEO2 summarises the current state of the industry regarding work for hire:

“As much as there’s a lot of talk and so on, it’s not real. Hopefully we can grow again, but the AU/US dollar has killed nearly every studio. That’s what got Krome, the work for hire, just killed them. You can’t do it, it doesn’t make sense to do when the Oz dollar is the way it is. We make a loss. You’re cheaper in LA than you are in Australia right now. If I’m sitting in LA and I can walk across the street and tap the developer on the shoulder and say “hey!” I’d do it. Or, I can take a huge risk, get these guys halfway around the world that sound funny
and you have to take 15, 16 hours to go and visit them, what are you going to do?"

As described by CEO₂, the Australian dollar rendered dependence on the work for hire model largely unsustainable. CEO₂ comments on the need for original content:

“... as I said previously I don’t think work for hire is sustainable any more as the only way you can run your business or more than 50% of your business. There will always be an element of work for hire but unless you’re creating original content it’s going to be very difficult to exist in this environment.”

The decline of work for hire and the increasing importance of original content are problematic. The work for hire model is relatively low risk at first glance; studios outsource certain components of a game development project (or alternate versions, such as a Wii port of a Playstation 3 title) to another studio of developers that offer general or specialised development skills (Chapple, 2012b). Candidates for outsourcing are likely to be located in countries that offer value to the original IP or license holder. Australia was an attractive option for developers of large scale titles in the latter part of the last decade due to the relatively low Australian dollar and talented workforce (Parker, 2011b), but the rise of the dollar above parity with the U.S. dollar damaged the ongoing viability of outsourced development as a reliable revenue stream.

CEO₂ indicates that work for hire will likely play some part in the business model of a local developer, but sustainability is reliant on the development and production of original content. Relying on development of original content bears a greater risk for obvious reasons; the outcomes are far less certain, while development time and costs are greater. The lowering of traditionally prohibitive barriers, largely financial, have allowed smaller developers to publish successfully on platforms such as iOS. Queensland-based developer HalfBrick for example have achieved significant success with titles on iOS platforms (Kuchera, 2013).

If education has a role to play in advancing the development of original content, it is possibly through ensuring the type of education provided for aspiring developers is consistent with industry’s direction. Graduates who are technically proficient are a
baseline requirement, but graduates who possess creative flair and sophisticated design sensibilities are arguably more likely to contribute to the development of original content. CEO\textsubscript{1} summarises the work for hire model in the present day:

“I think the days of the large scale studio in Australia are over. Certainly the days of a large studio doing work for hire/fee for service stuff are gone.”

Given respondent comments and statistical evidence, the shift away from large studios reliant on outsourced development toward smaller independent studios focused on development of original IP is in progress. The new development landscape is dynamic and evidently volatile, and the role of education within it is not clearly defined.

**Theme summary**

This theme provides a snapshot of the current state of the industry and presents a number of issues identified by respondents as key. The state of industry obviously has a significant impact on the place of the GDE graduate within in and as indicated by respondents, GDE graduates do not figure prominently in among the key challenges faced by the Australian industry.

1. Education and graduates are not currently a major priority for industry.
2. Attracting investment (and adapting to become an attractive investment proposition) is now a key issue for at least a portion of the Australian games industry.
3. Graduates should understand the business side of game development; industry (and by extension education) has a duty of care to impart this understanding.
4. The work for hire model is no longer sustainable (at least not as a sole source of revenue); original content is required for studios to remain sustainable and grow.

The Australian games industry is evidently in a transitional phase. From a handful of large studios and over 1400 employed developers to many small studios and a marked reduction in developer numbers, the scale of the Australian industry has shifted
dramatically in the last decade. While acquiring new talent to fuel the work for hire boom was once a priority, financial factors are now foremost in the minds of industry heads. Education’s role in this development is obviously limited, but ensuring the realities of the business of game development are imparted to students is one possible contribution education can make. The final theme of this discussion is the future of the industry and the role of education in shaping that future.

5.5.2 Future

Interview participants were asked to speculate on the future of the Australian games industry and offer some insight into the role education would play. Interviewees were asked to look five years ahead as a rough guide.

Cloud development

CEO2 pointed to cloud connectivity as the next phase in game development:

“The thing is that where everything is headed is away from console; I firmly believe that the PS4 will probably be the last Playstation, because with connectivity like NBN, the cloud is the answer. Because of that, that means the devices are reasonably dumb and the work is being done on the server so there’s greater accessibility for those guys programming on iPhone today, they can be programming for the cloud tomorrow. I see these devices as the first wave, but there’s a huge tsunami coming which is that televisions will be smart enough to play UT (Unreal Tournament) because they’re only rendering.”

The suggestion that iPhone developers (or developers for similar platforms) can transition to a cloud based platform is notable given the apparent shift toward such platforms (particularly in the Australian industry) at present. CEO2 continues:

“You just need a rendering widget, a browser, for games, across any platform. Instant on. No install. Devices can’t crash. Very connected. Play on any
device, watch any other game on a device as a voyeur. Anywhere anytime.

Games are going to become more accessible, touch more people and the models are going to change. It’s going to be the new TV.”

The ubiquity of games, borne on the back of capable personal devices such as smartphones, will increase according to CEO 2 as games made available via cloud technology continue to develop. The previous comment by CEO 2 suggested that developers for mobile platforms, such as the iPhone, can potentially transition to these new platforms. Cloud based game services have had a chequered history to date (Kruger, 2013) but are expected to grow substantially in coming years (Buchanan, 2013). Assuming this growth occurs as expected, the capacity for developers to transition to cloud gaming development may afford the Australian industry an improved opportunity to re-establish itself. CEO 2 offers further comment on the impact cloud computing will have on the industry at large:

“It’ll be on the cloud. That will lift the bar on game quality. You’ll be competing with the world. Processing power will not be a barrier and with that, the cost of games will go through the roof. The number of people required to make them will go through the roof. We are going to lose the middle ground. There will be low end and there will be blockbusters and there will be nothing in the middle, a wasteland. It’ll be budget films or massive blockbuster, and the blockbuster will see the hire of loads of people. That’s what I think anyway.”

This loss of the game development middle ground is seemingly underway already (Stuart, 2012). This may impose further limits on graduate opportunities. Earlier comments by CEO 2 suggesting console development is becoming ever more difficult to break into (“But the pointy end, where pretty much everyone wants to be... it’s almost like saying ’I want to be an astronaut or I want to be an actor’ – we’re starting to fall into that category”) and the likely decline in the middle ground reinforces the likelihood that the lower end of the market is the most likely outcome for GDE graduates. Once the top tier expands as suggested by CEO 2, employment opportunities should expand markedly given the number of developers required to produce titles at the top end. This may, theoretically, allow the work-for-hire model to once again become an attractive option, though a key reason for this model’s success was the cost effectiveness of outsourcing to Australian studios.
Education

CEO1 commented on the role of education going forward:

“(for education) It’s staying up to date and trying to forecast what’s happening a year ahead. But, the industry is starting to standardise as well. There are gradually more standard ways of doing things, standard engines and standard libraries.”

It is unclear how the transition to smaller studios would affect efforts to standardise industry if at all; regardless, standardisation of the games industry is an encouraging prospect for education given the difficulty in implementing current and relevant course material. Respondents did not elaborate further on the role of education which is understandable; their concern lies with their industry. It is from their comments about industry that some indication of the direction education should take can be determined: a greater focus on low end development techniques, consideration of cloud development as a future base upon which to develop courses and expectation of an improved level of standardisation for tools, software and techniques.

Independent studio sustainability

The shift toward smaller studios, often independent, is a recurring sub-theme throughout this chapter. Respondents dealt with the indie phenomena specifically, framing the shift in terms of sustainability and suitability for graduates. CEO2 offered a sceptical appraisal of the independent games movement in Australia:

“I wouldn’t put a lot of stock in them (indie studios). There’s probably 1 or 2% of them that are going to be around this time next year, and maybe there’ll be a whole different slew of studios that will be there to replace them but unless they’re a sustainable model that’s not going to supply long term employment for anyone. That’s just the reality. Unless they have that breakout hit, lightning in a bottle, it’s a tough gig”
These comments query the validity of independent studios as employment prospects for applicants (graduates or otherwise). The “lightning in a bottle” comment suggests that the independent model is precarious and the studios themselves ephemeral. CEO_1 comments further on the apparent ephemerality of new independent studios:

“I think indie studios at the moment is a fad because there are so many guys that have come out of big studios that have crashed and are trying something because there’s no jobs. Fast forward a year and I don’t think those same people will be in indie studios, I think those indies will move into a domain of grads that can’t get a job and they’ll have a crack for a few years at that. In 18 months there may well be a job shortage.”

This raises several points of interest. Firstly, developers formerly employed at larger studios have created their own start-ups given the lack of available positions; this is consistent with the reported state of the current development landscape in Australia. Figure 4.8 (Chapter 4: Results, Section 4.2.4) shows 74% of industry survey respondents had worked at a previous studio. Many of the former studios listed were among those that closed between 2009 and 2012. Further, 66% of the studios listed as current by survey respondents in table 4.14 (Chapter 4: Results, Section 4.2.3) were classified as independent (according to the classification system used on the Tsumea site (Tsumea, 2014)). These figures would seem consistent with CEO_1’s comments.

The second point of interest raised by CEO_1 is that independent studios will become the domain of graduates who cannot find work with an existing studio. Again, the role of business and marketing skills is pertinent from an educational perspective. However, if that were the case, and independent studios are not adequately sustainable as suggested by CEO_1, it would be irresponsible to produce graduates who are faced with starting their own studio as the most likely option post-graduation. This also raises the possibility that the existence of GDE courses is, at present, unnecessary. Earlier comments about qualifications being general enough to allow graduates to seek work in other IT fields are also pertinent here.

Thirdly, CEO_1 raises the prospect of a skills shortage arising once experienced developers have either gained employment with another studio, started their own
independent studio or moved on to other industries. Should this occur, GDE courses would suddenly become more relevant but would be producing graduates for a significantly altered industry. However, recent figures suggest that a skills shortage is unlikely in the short term (Pink, 2013). CEO1 offers further caution to those seeking to create an independent start-up:

“I think if you’re starting an indie studio regardless of experience or not, if you’re doing it to be sustainable and make money, you’re setting yourself up for failure. If you’re doing it for the love of it, and you really want to make your own games and you can financially sustain yourself, then great, but indie studios on the whole are not viable, sustainable businesses. Some will be, 2 or 3% globally will achieve success but for every Minecraft there will be thousands of other interesting, cool, beautiful games that pass unnoticed.”

Despite the numerous and well publicised successes of recent years, little has been published (beyond anecdotal and widely varying first-hand accounts through portals such as Gamasutra) on the viability of independent game development. CEO2’s comments suggest the majority of independent development ventures will be unsustainable, whether created by experience developers or not. Again, if the industry is at the point where the handful of studios that remain are unable to sustain the number of graduates being produced by GDE courses, GDE courses may well be unsustainable themselves.

CEO1 adds further points to consider for potential indie developers:

“If you’re an indie studio, there are barrier entries restricting which platforms you can develop for and markets you can compete in.”

CEO1 continues:

“It’s highly unlikely an indie studio would get accredited unless they have a track record of making some really interesting stuff. That means that indie studios are confined to PC, Facebook, iPhone, Android. So that’s the first problem, they have a limited market that they can pitch into. The second problem is the marketing more than the business skills. They need to be able to do the marketing themselves or getting a PR company to do it for them. Money
Accreditation and financial barriers are highlighted as limitations on the markets that are available to independent developers. This may not be a relevant issue for developers who cannot attain accreditation, as platforms that do not feature accreditation barriers (or less stringent barriers) may be enough to sustain a studio. The number of active smartphones alone, worldwide, is expected to top 2 billion by 2015 (Yang, 2012). Obviously these devices are not dedicated gaming devices and in this way differ from platforms such as the major home and handheld gaming platforms, but many studios (including a number of Australian studios) have built a sustainable development model around these platforms.

**Theme summary**

The comments from interviewees, particularly from CEO₁, are cautionary about the future of the industry in Australia. The shift toward smaller independent studios is apparent, but the long-term viability of such studios is in question. Little comment was made specifically on the role of education in the future of the industry (CEO₁ suggest that education does not feature prominently among industry’s priorities in the short term), but assumptions about the possible role of education can be made from participant responses.

The following is a summary of the points drawn from this section:

1. CEO₂ identifies a move toward cloud computing as the next major shift in game development and suggests that developers working on lower end (smartphone, tablet, lower end PC) titles will be able to transition from those platforms to cloud game development.
2. Middle ground titles will likely decline further, leaving lower end and top-tier ‘AAA’ development as the two major development domains.
3. Concerns were raised about the viability and sustainability of the independent development model. Once experienced developers move out of
the independent space (assuming a lack of success), a skills shortage may result.

4. CEO₁ comments suggest that the industry is standardising, which is encouraging for educators seeking reliable techniques and standards upon which to base course content.

5. CEO₁ expressed caution about the viability and sustainability of independent studios. CEO₁ also identified cost and accreditation barriers for independent studios that dictate available markets. Finally, CEO₁ raised the prospect of graduates being the most likely to create independent start-ups once experienced developers decide to seek more consistent sources of revenue (assuming they fail to create successful titles).

These points are instructive for educators insofar as they provide some insight into how the industry might look in the future. The supposed decline of the middle tier of titles leaves opportunities at the top and bottom ends. These are distinctly different and teams at either end require different skill sets; utility and multiple skill sets for the lower end, versus a more specialised technical skill set for the top end. This raises the prospect that a ‘one size fits all’ approach from GDE course developers may not be viable and specialist courses that target a particular industry tier may be warranted. CEO₁’s comment indicating that lower end developers can transition to cloud development is encouraging and perhaps alleviates the need to diversify courses too greatly (if at all). Comments that indicate the industry is standardising are obviously encouraging and likely helpful to educators seeking certainty about the tools and techniques used in GDE courses.

5.5.3 Summary

In addressing the question “How can education meet the needs of the Australian games industry in the future?” a number of key points have emerged. In short, GDE courses must adapt to the changing face of the local industry which may not actually be able to sustain GDE courses in the short term given the significant reduction in developer numbers. Assuming GDE courses are still a viable proposition, the industry is experiencing a transition from large commercial studios to many small independent studios. In order to cater for this shift, education must supplement the standard
technical content with business and marketing content, adding these skills to graduate attributes. An understanding of the business of game development is becoming ever more important.

The work for hire model, a one-time staple of the local industry, is flagging significantly due to economic factors. As a result, studios must create original content if they are to survive. From an educational standpoint, graduates who are well versed in the development process and are capable creatively will be of greater value than graduates are merely technically competent. Content and collaborative project-focused curricula become ever more important. According to CEO2 developing for the cloud will become more commonplace and developers from the lower end will be able to transition to cloud-based platforms. To that end, education may need to consider how a shift to such platforms will affect course structure and content. If nothing else, the increase in complexity for top-end development will require ever more developers, an encouraging thought for graduate prospects. Below is a summary of the two themes explored in addressing this research question:

**Industry in the present**

1. Education and graduates are not currently a major priority for industry.
2. Attracting investment (and adapting to become an attractive investment proposition) is now a key issue for at least a portion of the Australian games industry.
3. Graduates should understand the business side of game development; industry (and by extension education) has a duty of care to impart this understanding.
4. The work for hire model is no longer sustainable (at least not as a sole source of revenue); original content is required for studios to remain sustainable and grow.

**Future**

5. CEO2 identifies a move toward cloud computing as the next major shift in game development and suggests that developers working on lower end
(smartphone, tablet, lower end PC) titles will be able to transition from those platforms to cloud game development.

6. Middle ground titles will likely decline further, leaving lower end and top-tier ‘AAA’ development as the two major development domains.

7. Concerns were raised about the viability and sustainability of the independent development model. Once experienced developers move out of the independent space (assuming a lack of success), a skills shortage may result.

8. CEO\textsubscript{1} comments suggest that the industry is standardising, which is encouraging for educators seeking reliable techniques and standards upon which to base course content.

The future of the Australian games industry has sustained a major change in the last five to ten years and educators running GDE courses must maintain ever closer contact with industry representatives in order to ensure they remain current and relevant.

5.6 Chapter Summary

The following is a concise summary of each research question and the main points that arose as each was answered.

5.6.1 Research Question One

Based on the collected data (and consistent with appraisals of GDE from other industry sources), Australian game developers have a distinctly negative perception of Australian GDE courses.

Industry is generally dismissive of education, sceptical about the content used by educators and the competence of the educators themselves. Industry also considers GDE-specific qualifications to be, generally, of little value to studios seeking to hire developers. Survey respondents in particular were quite sceptical of the validity of GDE courses; some considered them to be little more than a commercial venture.
Several respondents pointedly raised the use of free online resources as providing a better grounding for a game development career.

Respondents indicate that this negative perception has developed through unsatisfactory interaction with educators that oversee GDE programs and with graduates who have completed a GDE-specific qualification. Respondents indicated there is a desire to interact with educators if the outcomes of such interaction are mutually beneficial. It would appear that respondents do not see the value of interaction with educators beyond offering their input but are curious as to what commercial opportunities can be explored (if any) via education. This attitude is indicative of industry’s current focus on attracting investment.

5.6.2 Research Question Two

Responses revealed various features of an ideal graduate skill set and general educational background that are considered preferable. A summarised list of desirable attributes is as follows:

- A generic CSE qualification is preferred for technical roles ahead of a GDE-specific qualification.
- Broad knowledge of the development process (particularly in small teams as are to be found in the expanding ‘indie’ portion of the industry) and experience in an interdisciplinary and collaborative environment with particular emphasis on cross-disciplinary communication skills (interpersonal skills featured heavily among skills listed by industry survey respondents).
- Solid grounding in the technical fundamentals of game development: C++, mathematics, basic AI (finite state machines), fundamental 3D modelling principles (irrespective of software). The turnover of technology (game engines for example) is acknowledged as a difficult moving target for educators.
- Graduates must be technically competent but not at the expense of developed teamwork skills.
- Design roles are likely to be filled by experienced developers; CEO1 indicates that those seeking design roles should also be competent programmers so as to be able to demonstrate implementation of their designs.
Graduates should have completed substantial extra-curricular game development to demonstrate their technical competence, creative nous, capacity to complete a self-directed project and passion for the medium.

While group work is encouraged (as marked by the emphasis on interdisciplinary experience), a graduate should provide examples of their own personal work to demonstrate their skillset. Furthermore, reliance on course-work alone is not advised.

A generic qualification combined with a GDE-specific qualification may be advantageous to graduates in that the grounding provided by a generic program can be supplemented with domain-specific knowledge. This is summarised by CEO₂’s view that private GDE institutions act as ‘finishing schools’.

Other findings include further points about graduate attributes and graduate opportunities in the current employment market. CEO₂ suggested that applicants for art roles were more likely to come from a GDE specific background than those seeking technical roles. However, the percentage of employees with a GDE specific qualification employed at CEO₂’s studio was estimated to be as low as 20%. Senior respondents suggested that outside of the game development industry (in which opportunities are limited), such qualifications lack utility and are perceived as trivial by non-game development employers.

Graduate opportunities are limited as experienced developers are available to fill roles; CEO₁ contrasted the skills shortage of 2006 and 2007 with the current influx of developers from larger studio closures. Responses indicate that despite the financial incentives, internships are often problematic and less likely for smaller studios that require experienced, multi-skilled developers. Few survey respondents had completed internships. Regarding the sustainability of GDE courses versus the number of available roles, CEO₂ suggested that console development is out of reach for many graduates and positions are scarce. CEO₂ noted however that the serious games sector may provide far more substantial graduate opportunities than are available in the commercial games sector.
5.6.3 Research Question Three

The outcomes for this question are not as clearly defined as was the case for the previous questions. Respondents offered (understandably given the question) speculative suggestions about the future direction of the industry and possible shifts both in terms of target development platforms and the shape industry will take. As a result, the role education will play in that future remains unclear. However, respondents did offer points of interest that could provide educators with indicators used to direct future GDE implementations.

The short answer to the stated research question is that, given the lack of a clear direction, Australian GDE courses must develop an improved means of interacting with industry to ensure content remains relevant and applicable for local studios. An industry shift is underway as indicated by the drop in developer numbers combined with an increase in studio numbers. Studios are now on average far smaller and as indicated by respondents, less able to accommodate graduates. At this point, education and graduates are not a priority for industry. The work for hire model has largely expired; that gap, according to respondents, must be filled with original content. As a result, attracting investment and funding is a priority for studios.

If graduates are to find a role in the changing Australian industry, respondents indicate that business and marketing skills will become more important as studios seek to produce more original content. CEO2 suggested that industry has a duty of care to impart the basics of the business of games to future developers so that they are adequately prepared for a game development career. Senior respondents indicated that the industry is standardising to an extent, which will likely ease the process of maintaining relevant and current content for educators. Finally, regarding the direction of skill development and likely platforms, CEO2 indicated that a shift to cloud gaming will eventually occur. This shift will likely result in the dissipation of the middle tier of developers, leaving the high end and independent models as viable. CEO2 also suggested that those developers working on smaller mobile platforms will be able to transition to cloud game development.
Conclusion

6.1 Introduction

The aim of this research was to explore the Australian games industry’s perspective on game development education; their perception of GDE, the issues they faced when hiring graduates, the skills they required of applicants, the problems they as an industry would face in the future and the role, as they saw it, of education in that future. This chapter presents the final outcomes of this research in the context of the overall research aim, the potential ramifications of this research from a practical and theoretical viewpoint, limitations of the research and any future research to be conducted following the findings contained in this thesis.

The Australian game development landscape has changed markedly in the past five to seven years and GDE courses are no longer servicing a thriving industry. GDE courses, like the industry they service, must adapt. In Chapter 5: Discussion, CEO1 summarised the shift away from large studios and the effect this had (and is having currently) on GDE courses:

“Then 2006 and 2007 happened and people started hiring like crazy and all these games courses started and these specialist unis started that just focused on game dev (AIE, Qantm)... As a result, even more unis started offering courses and AIE and Qantm ramped up even more and then the crash happened, and now we’re in a situation where it’s not going to go back to anywhere near where it was.”

Prior to this research being conducted, relatively little published material on Australian GDE existed. This research revealed the negative perception of GDE by industry and clarified the underlying causes of that perception, specifically a low standard of graduate skills and ineffective interaction with educators. This research also clarifies the type of broad skillset industry requires of potential developers. The importance of interdisciplinary collaboration in particular, a trait unique to the games
industry, was established as a necessary component of any Australian GDE student’s education. This research also provided insight into the state of industry now and potentially in the longer term, and highlighted points of interest for GDE educators for future course structure and content.

6.2 Achieved Research Aims

The aim of this research was to explore the industry perspective of the Australian game development education landscape. Justification for this research arises from past studies, anecdotal evidence from industry representatives (globally), limited published research and personal experience. This research, adopting an Australian focus, sought to uncover the issues local industry encountered when interacting with education and determine what, if anything, industry required of education given the apparent lack of confidence in games-specific education. This research is intended to be applicable to educators who manage and developer GDE curricula.

The broad focus of this research was the industry perspective on GDE. Three key points of inquiry were identified and used as the basis for three research questions; specifically, industry’s perception of education, industry’s preferred educational background of an applicant, and the state of the industry currently and in the future (pertaining to education’s role in that future). In addressing these three points of inquiry, it is determined that the research aims have been successfully met. The findings that determine how these aims were met are presented in the following section.

6.4 Findings

The following findings provide both a low and high level view of the Australian industry perspective through a detailed qualitative analysis supported by a low level quantitative analysis, respectively. These findings offer new insight to how industry views GDE and institutions that offer GDE programs, revealing a number of previously unknown or unclear issues. The findings are summarised in Tables 61, 6.2 and 6.3 and expanded upon below.
<table>
<thead>
<tr>
<th>Research question</th>
<th>Key findings</th>
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<tbody>
<tr>
<td>How are Australian game development courses perceived by Australian games industry and why?</td>
<td>GDE graduate skills (technical and interpersonal) are below the standard required by industry. Respondents expressed frustration about interacting with universities. Educators are perceived as unwilling or unable to utilise advice on methods and techniques offered by industry; the perception is that educators don’t ‘get it’. Respondents expressed concern that GDE qualifications lack utility and credibility within the broader IT industry. Respondents expressed a desire to assist students in a more formalised, mutually beneficial manner, though are not currently motivated to engage with education. Collaborations with commercial potential are appealing to developers and the resources offered by a university in terms of manpower are also appealing.</td>
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Table 6.1: Research Question One Key Findings

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<th>Research question</th>
<th>Key findings</th>
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<tr>
<td>What is the preferred educational background of the average Australian game development graduate seeking a game development career?</td>
<td>Applicants should ideally possess a qualification (generic Computer Science for programmers or traditional art courses/private GDE institutions for artists preferred). Industry values experience in a collaborative interdisciplinary environment coupled with communication skills and knowledge of development process. Solid technical grounding in the foundational elements (programming languages, AI) can be reliably implemented in courses. A personal folio is important in that it demonstrates technical competence. The quality of extra-curricular work is the first line of review for studios. Business and marketing skills, becoming more relevant as the industry moves to a more independent studio model that requires a multi-skilled workforce. GDE graduates are disadvantaged by their qualification. According to respondents, GDE graduates are not preferred by industry. Knowledge of other disciplines is becoming more important as industry shifts toward smaller teams. Graduate opportunities are very limited for a number of reasons. Private colleges produce more currently skilled graduates, but generic university courses produce better quality graduates overall.</td>
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Table 6.2: Research Question Two Key Findings
Table 6.3: Research Question Three Key Findings

<table>
<thead>
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<th>Research question</th>
<th>Key findings</th>
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<tr>
<td>How can Australian game development courses service the needs of industry in the future?</td>
<td>Despite the upheaval, respondents indicated that the industry is standardising; this is encouraging for educators seeking reliable techniques and standards to guide course development.</td>
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<td></td>
<td>Attracting investment (and adapting to become an attractive investment proposition) is now a key issue for the Australian games industry.</td>
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<td></td>
<td>Respondents determined that industry (and by extension education) has a duty of care to impart an understanding of the business side of game development to students.</td>
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<td>The work for hire model is no longer sustainable; original content is required for studios to remain sustainable and grow.</td>
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<td></td>
<td>Cloud development is expected to drive many of the major development projects in the future.</td>
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<td></td>
<td>Concerns were raised about the viability and sustainability of the independent development model.</td>
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How are Australian game development courses perceived by Australian games industry and why?

GDE course are perceived negatively by industry. The vast majority of responses to survey and interview questions were negative in tone or content. Reasoning for this perception is as follows:

- GDE graduate skills (technical and interpersonal) are below the standard required by industry.
- Respondents expressed frustration about interacting with universities. Examples included differing ideas about course content, lack of organisation and lack of understanding on the part of educators as to how the industry operated.
- Educators are perceived as unwilling or unable to utilise advice on methods and techniques offered by industry; the perception is that educators don’t ‘get it’.

Other key findings:

- Respondents expressed concern that GDE qualifications lack utility and credibility within the broader IT industry.
Additionally, respondents expressed a desire to assist students in a more formalised, mutually beneficial manner, though are not currently motivated to engage with education.

Collaborations with commercial potential (such as student teams using studio concepts as raised by CEO1) are appealing to developers and the resources offered by a university in terms of manpower are also appealing in this context.

What is the preferred educational background of the average Australian game development graduate seeking a game development career?

The average Australian game development graduate should possess the following traits, skills and experience:

- Applicants should ideally possess a qualification. If seeking a technical role, a generic Computer Science qualification is preferred by industry. Art roles are more likely to be filled by those from traditional art courses or private GDE institutions.
- Industry values experience in a collaborative interdisciplinary environment coupled with excellent communication skills and an understanding of the development process. Respondents inferred the importance of this experience in an educational setting.
- Solid technical grounding in the foundational elements (programming languages, data structures, finite state machines for AI) can be reliably implemented in courses.
- A personal folio is important in that it demonstrates technical competence aside from any group work. The quality of extra-curricular work is the first line of review for some studios. Coursework alone is an inadequate predictor of success. Extra-curricular work also demonstrates drive, application, passion for the medium and capacity to complete a self-directed project.
- Possible business and marketing skills, becoming more relevant as the industry moves to a more independent studio model that requires a multi-
skilled workforce.

Other key findings:

- GDE graduates are disadvantaged by their qualification. According to respondents, GDE graduates are not preferred by industry.
- Knowledge of other disciplines is becoming more important as industry shifts toward smaller teams.
- Graduate opportunities are very limited. Respondents identified a number of influential factors, including large studio closures causing an influx of experienced developers (and alleviating any skills shortage), a lack of internships in the now prevalent smaller studios (due to the necessity of multi-skilled and experienced staff) and excess GDE graduates applying for positions in the games sector.
- Private colleges produce more currently skilled graduates, but generic university courses produce better quality graduates overall.

How can Australian game development courses service the needs of industry in the future?

The Australian games industry is in a transitional phase, so the role of educators who are aligned with GDE to service the needs of the industry is not entirely clear. The industry has suffered significant downsizing in recent years. The shift toward smaller studios is pronounced, so developers with a wider skillset will be of more value to industry than those of a narrower skill band. An understanding of the business and marketing side of game development is increasingly important when considering graduate outcomes.

Whether educators should adapt course content and structure accordingly and produce graduates who are equipped to negotiate their own development enterprise rather than seek employment with an existing company is also unclear at this point. According to respondents, education and graduates are not currently a major priority for industry, suggesting that educators need to bridge the gap to ensure their courses remain relevant. A short answer to this research question is that if GDE courses are to remain
viable (and this is uncertain given the state of the local industry), graduates need to be creators, rather than just developers. A technical skillset is as important as ever, but a holistic view of the development process is required to fully realise opportunities. Outcomes that contribute to this reasoning are as follows:

- Despite the upheaval, respondents indicated that the industry is standardising; this is encouraging for educators seeking reliable techniques and standards to guide course development.
- Attracting investment (and adapting to become an attractive investment proposition) is now a key issue for at least a portion of the Australian games industry as it attempts to reinvent itself.
- Respondents determined that industry (and by extension education) has a duty of care to impart an understanding of the business side of game development to students.
- The work for hire model is no longer sustainable (at least not as a sole source of revenue); original content is required for studios to remain sustainable and grow.

Other key findings:

- Cloud development is expected to drive many of the major development projects in the future. Lower end developers should be able to transition to this development, but mid-level development will likely expire.
- Concerns were raised about the viability and sustainability of the independent development model. Once experienced developers move out of the independent space (assuming a lack of success), it may cause a skills shortage.

These outcomes suggest that the relationship between local education and industry is fractured and the two stakeholders are presently, to an extent, incompatible. Expectations from either side are seemingly misguided; certainly industry’s expectations of GDE-educated graduates have not been and are not being met. Each stakeholder operates on a different time scale; game development iterates rapidly and tools and technologies are quickly rendered obsolete, while education is unable to overhaul course material at the same pace (Swain, 2009, p. 195) (Onen et al., 2011, p.
42). As noted in Chapter 2, Swain offers several methods of engaging with industry which might be employed by educators in the shorter term, such as inviting developers to attend student showcases.

The goals of each stakeholder also differ; the games industry is focused on re-establishing itself in a business and financial sense, adapting to reliance on original projects and moving away from the work-for-hire model (Parker, 2011b). These goals, according to respondents, do not currently include acquisition of GDE graduates as the demand is insufficient. This raises new questions about how each stakeholder might contribute to greater availability of opportunities for graduates. Possible solutions are presented in Section 6.6. New knowledge about the industry view as presented in this chapter highlights the importance of this research and the value of a detailed exploration of stakeholder perspective.

Regardless of the quality of GDE courses, the drop in developer numbers reported by Pink (2013) suggests that the Australian games industry is unable to provide enough employment opportunities to graduates. Whether courses can be revised to better suit the current independent studio-driven climate and whether they can meet industry once the industry has regained some measure of its previous size; these are perhaps more relevant questions and require consideration of systemic issues. A key issue that may affect the utility of GDE courses is the accreditation process.

Each of the institutions listed in Chapter 1: Introduction, bar AIE, is accredited by the ACS (Australian Computer Society). The constraints imposed by the ACS as part of their accreditation are applied in the interest of ensuring an appropriate standard of tertiary IT and IS education programs and are entirely appropriate for those programs. However, these accreditations are applied with the broader IT industry in mind; that game development is considered a part of this industry, despite its inherent and substantial creative component, is perhaps problematic. As indicated by comments and survey responses throughout this chapter, game development differs from ‘straight’ IT in that it is interdisciplinary, creative and, for most part, focused on producing entertainment products. Film Victoria offers funding programs to game developers in order to facilitate the production of interactive media (Film Victoria, 2012). The involvement of a body such as Film Victoria aids in defining games in the local context.
as having cultural value and being a part of the creative industries (Roodhouse, 2008). It is unclear, then, whether the accreditation by a body such as the ACS is appropriate for GDE courses.

Furthermore, as GDE courses are no longer servicing an industry composed of large companies that can accommodate graduates in a formalized manner (via internships for example), the applicability of an ACS accreditation should be questioned. AIE, an institution whose course are not accredited by the ACS, are arguably in a better position than accredited universities to respond to the fluid and dynamic shifts that have occurred within the Australian games industry. The comment from CEO\(^2\) suggesting that the private colleges are akin to finishing schools would seem to support this assertion. Tertiary institutions that seek ACS accreditation cannot alter course structure dramatically (and outside of the ACS’s prescribed structure) year to year. The games industry (and similar digital media industries), perhaps awkwardly regarding accreditation, straddles the line that separates the technical from the creative. Game development is very content-focused; comments from interview respondents reinforce the value of extra-curricular work and interview decisions are heavily influenced by folio quality. This might conflict with the exam-based assessment model typical of IT units.

As recent history suggests, industry change can be swift, volatile and dramatic, altering how, where and for whom an entire industry produces commercial content. The rise of mobile (and tangentially, independent) development and the decline of large studios occurred within the space of a few years; this change is proof enough of that volatility. Education, if it wishes to provide graduates capable of contributing to these dynamic industries must be able to change as those industries change. Further research is required to properly quantify the effect that course accreditation has on the utility and adaptability of Australian GDE courses, but, speculatively, it may be that accreditation bodies like the ACS are not able to accommodate the type of dynamic, content focused outcomes evidently required by creative media industries (and the courses that seek to service them) if they are to remain relevant.

The UK-based Skillset accreditation body (Ip, 2012, p. 6:3) has been designed to deal with creative digital media industries specifically, including game development.
A body such as this, in place of the ACS, may be better equipped to facilitate the adaptive flexibility evidently required by GDE courses. The Incubator program offered by AIE (2013) appears to be reflective of the changing nature of the Australian industry; the lack of ACS accreditation may in this case be advantageous. Beyond the possible issues surrounding GDE course accreditation, the broader issue of accreditation for digital media industries, particularly whether a digital media-specific accreditation body would provide greater flexibility for these industries that mix the technical and creative, warrants exploration.

6.5 Limitations of This Study

The chosen methods and structure of this research presented several complications and potentially limited the effectiveness of this research. This research employs a number of research tools in aid of developing as complete a view as possible. In aid of this aim, the process of coding interviews, collating survey data from two different groups and attempting to draw links between the two data sources was a lengthy process; as a result, the immediacy of the data was partially dulled.

The complexity of breadth of data left many factors to consider when drawing the threads of each major theme together. This made defining the precise meaning behind respondent data equally complex. However, the exploratory nature of the research dictated that a wider range of data would provide a better opportunity to develop a complete view of the industry-education relationship. Despite the complexity and overlong gestation period, meaningful findings have emerged from this research. Further, this study focuses almost solely on the industry perspective. If a completely balanced study were to be conducted, then equal representation from both education and industry would have better serviced this goal. It was determined for the scope of this study that the industry perspective was an adequate demarcation point, but an educational view would clarify and contextualise some of the respondent statements.

The relatively low number of respondents for the interview component was cause for concern that the conclusions may lack weight, possibly affecting the validity of the research outcomes. However, despite the limited number of interviewees, it was determined that the seniority and elevated perspective of the interviewees that
participated lent validity to any conclusions reached. Directing the interviewees along a more rigidly defined interview path would not have differed greatly enough from the quantitative results to justify their inclusion. The open nature of the interviews was therefore a conscious decision to allow the interviewees space to speculate freely on the topics presented to them, while the survey results complimented and in some cases enhanced statements made by the interviewees.

Finally, the literature review contained in this thesis focuses largely on GDE specific literature which is relatively sparse. Adding literature on pedagogical theory provides a broader educational perspective, thus placing GDE in a broader educational context and extending the admittedly limited generalisability of the research. However, the research aims did not involve generalising findings beyond the scope of GDE, therefore the literature is primarily GDE focused.

Future research in the same field would benefit from several alterations to the approach employed here. Narrowing the scope of the research to a specific issue, such as skills, internships or industry development, might provide a deeper analysis of that single issue. Further, narrowing the topic would enable a simpler analytical process as the limited themes and results would be easier to interpret and transfer to practical application.

6.5 Future Research

This research was designed to reveal the issues with GDE as determined by the Australian games industry and act as a base upon which further work (practical and theoretical) could be conducted. However, it was not intended to provide definitive solutions to all of these issues. The following is a summary of studies that should be conducted following the presentation of this research.

The educational theory presented in the literature review is limited and was intended to provide some measure of the theoretical underpinnings of GDE. However, an opportunity exists to further exploration of GDE theory, including theoretical approaches to teaching GDE, theory that describes the nature of interaction between industry and education (such as Symbolic Interactionism) (Becker and McCall, 2009).
and educational literature from similar fields. Ultimately, a theoretical basis for GDE programs might be developed.

Interaction between industry and education was identified as problematic and the underlying causes of these problems were also identified. Suggestions from respondents about the kind of interaction that would be deemed suitable were explored, but were not specifically a research focus. To that end, studies that develop and propose methods of interaction that are mutually beneficial to both industry and education are warranted. Respondents indicated that developers are time poor but willing to interact, so devising a means of creating mentoring opportunities that have minimal impact on developer time but also harnesses their interest in assisting students is also warranted.

The gap between what industry requires and what education is able to provide is noted, so creating a means of collecting ongoing data on trends, technology and techniques from the industry at large could ensure games courses remain relevant. One to one, ad-hoc relationships are noted by respondents as a limitation of the relationship between industry and education, so a holistic industry wide level of involvement would be of benefit to both educators and developers. A review of current GDE curricula, in conjunction with an ‘education perspective’ study, could be conducted to allow educators to provide their perspective on the shortcomings of Australian GDE. Further, given the established importance of interdisciplinary collaboration, exploring the viability of meaningful interdisciplinary (and inter-school) collaboration within universities should be further explored locally, referencing models utilised in the UK and the US. The limiting organisational factors of facilitating an inter-disciplinary GDE environment also warrant further exploration. In practical terms, a content analysis of existing courses, possibly contrasted with game development employment advertisements, would provide some measure of the relevance of GDE courses.

A significant finding from this research, perhaps the key finding, is the lack of graduate opportunities through an influx of experienced developers back into the Australian game development job market. Furthermore, the shift away from large studios and towards small, independent studios, limits available entry-level jobs. GDE graduates, already disadvantaged by their qualification, are competing with developers for a limited number of positions and as such find themselves at the back of the queue.
It may be that until the industry regains some measure of its former scale, graduate opportunities will remain limited. It is therefore necessary to define precisely where graduates fit into the local game development landscape. Respondents in this study have indicated a need for graduates to possess a wider range of skills, including business and marketing skills, so a possible avenue for university educators is to develop curricula that promotes independent development as a viable outcome for students. Incubator programs have already been developed within private colleges.

Whether industry can also contribute to a more graduate-friendly employment environment, such as through the creation of dedicated graduate-only positions, is unclear. Based on feedback from respondents, currently, it would seem unlikely. Funding solutions from either private investment or funding bodies such as Film Victoria might assist in bridging the gap between the altruistic intentions of developers and the financial constraints they are subject to.

Regardless of how the industry is positioned in the future, assuming it can sustain itself and sustain graduates seeking a career in game development, game development education programs must ensure they remain relevant, viable and credible in the eyes of industry. The above suggestions can potentially go some way to achieving this. This research serves to illuminate some of the problems that hamper industry-education interaction and indicate potential solutions to these problems. It offers the industry view of education, at once both dismissive and hopeful of an improved relationship between the two bodies. It is hoped that the findings of this research contribute to a greater understanding of GDE and the Australian games industry, and can be used as a platform upon which future research in this field will be conducted.
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Appendices

Appendix 1: Industry Survey Questions

1. Age

2. Gender  ○ Male  ○ Female

3. Location

4. Studio/Company name

5. Have you previously worked at other game development studios?
   ○ Yes  ○ No

6. If you answered 'yes' to Question 5, please list the studios you have previously been employed by.

7. How long have you been working in the games industry?
   Less than 1 year  |  1-3 years  |  3-6 years  |  Over 6 years

8. What is your current role?

9. Do you have a formal educational qualification? If no, please skip to Question 14.
   ○ Yes  ○ No

10. Where did you study, what course did you complete at that institution, and during which period did you complete the course or courses?
11. What was your major or double major?

12. Did you participate in extra-curricular game development projects during the course?

   ○ Yes  ○ No

13. Please indicate your satisfaction levels regarding the course you undertook

   Very unsatisfied | Unsatisfied | Neutral | Satisfied | Very satisfied

14. Did any of your skills require improvement once you entered the industry?

15. Regardless of your educational background or current role, which 3 skills (soft or technical) would you regard as vital for aspiring student developers?

16. Did you initially take part in an internship or similar introductory program?

   ○ Yes  ○ No

17. Please add any comments you feel are relevant or appropriate to this survey, then click the Submit button which is located below the Plain Language Statement.

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Appendix 2: Student Survey Questions

1. What stage are you at in your current course?

First year | Second year | Third Year | Fourth year/Honours

2. Do you plan to pursue a career in game development?

☐ Yes ☐ No ☐ Undecided

3. What is your preferred game development discipline?

4. How well do you understand your preferred game development role? For example, if you want to be a games programmer, do you know exactly what type of programming role (e.g. tools programming, AI) you would like to fill and what that role entails?

☐ No understanding
☐ Low understanding
☐ Basic understanding
☐ Reasonable understanding
☐ Clear understanding

5. How would you define your knowledge of the games industry (roles, how projects are managed, the development pipeline) before you began the course?

☐ None
☐ Vague
☐ Basic
☐ Reasonable
☐ Strong
6. How would you now define your knowledge of how game developers operate and the games industry at this stage of your course?

- None
- Vague
- Basic
- Reasonable
- Strong

7. Do you plan to pursue a role at an existing games development company or do you plan to develop your own games as an independent developer (creating iPhone games for example)?

- Yes
- No
- Undecided

8. Would you apply for an internship position with a game development company if such a position became available?

- Yes
- No

9. Do you read articles about the games industry and game development (aside from reviews and previews) and/or attend game development conferences or trade shows (e.g. Freeplay, eGames Expo)?

- Yes
- No

10. Do you practice game development (solo or as part of a group, e.g. mod team) outside of the course/game development units? If yes, please provide a brief description. If no, please answer 'No' or leave blank.


11. Do you have any suggestions about how the course might be improved or features you would like to see implemented? E.g. more industry speakers, more group work, lesser or greater focus on a particular area (3D modeling for example), more gaming related social events?

12. Should you choose to pursue a career in game development, would you prefer to work in Australia or overseas?

  ○ Australia  ○ Overseas

13. Are you satisfied with the course/games units to date?

  ○ Yes  ○ No

14. Do you prefer working as part of a group or individually?

  ○ Group  ○ Individually

15. Please add any further comments you feel are relevant.

  
Appendix 3: Interview Questions

These are the areas and questions used to guide the interview. Not all questions were asked of each interviewee depending on the flow of the discussion, as some aspects were covered prior to the question being raised.

GDE specific

What is your opinion on the state of game development education/courses?

- If poor/unsatisfactory: what can institutions do to improve the quality of their offerings to students?
- How do you see education’s role in general?
- Any specific criticisms?

Do you think the local industry is big enough to warrant the number of courses that are currently running? Is the situation sustainable in your opinion?

Over the course of your career where have the majority of new employees at your then company at the time acquired their skills? CS degree, game development degree, no qualification?

Do you think a course or series of units that equip students with the skills to become developers in their own right (an ‘indie’ course) is viable? Business, marketing skills added the development skills?

Should courses specialise or generalise (e.g. programming only vs less developed single skill and broader understanding of game development)?

Industry

Do you think there is a skills shortage (overall)? Do you have trouble hiring?
Does industry place enough value on the role educational institutions play? Are developers making best use of what universities offer (in terms of possible research, talent pools)?

Difficulty in putting a games course together is adopting a development process (agile development for e.g.) since there are many different processes used by various developers. Does industry need a more formalised set of working processes/standards (either to do with project management, development itself or technology/software)?

Are the majority of your employees employed on a contractual or more permanent basis?

Does the contractual nature of many positions effect graduates chances of employment?

Skills

Describe your ideal graduate applicant.

What has been your experience with games course graduates (if any)?

Which skills are commonly lacking in the average game development course graduate (if any and if applicable)?

Would you take a graduate with a strong skillset and no game specific training over a graduate who is well versed in the game development process via a degree or similar but is less capable skill-wise?

2-5 skills a programmer should possess (regardless of specific position)

2-5 skills a designer should possess (regardless of specific position)

2-5 skills an artist should possess (regardless of specific position)
Do you require entry level applicants to possess a solid understanding of the game development process overall or are you primarily interested in skill level (both technical and soft) and personality or suitability to the work place/environment?

Collaboration

What (if anything) do you need or would like to see from educational institutions?

Would you support a more structured interface/collaboration between institutions and industry, possibly via an intermediary body rather than directly with universities or colleges themselves?

Would you support the inclusion of or offer internships or a similar program if possible?

Would you be willing to work with educational institutions to assist in improving the quality of graduates with a view to an improved talent pool (e.g. speaking to students)?

Future

Where do you see the industry in 5 years time?

How can education meet the needs of Australia’s industry at that point?
Appendix 4: Interview Transcripts

Please follow this URL to retrieve the senior developer interview transcripts:
Appendix 5: Ethics

Ethics approval

Reference: STEC-09-2009-BOWTELL - HEAG approval lttr

September 2009

Mr Gregory Bowtell
9 Lambhill Crescent
HIGHTON VIC 3216

Dear Greg

STEC-09-2009-BOWTELL – Reflection on game design and development education in Australia.

Thank you for submitting the above project for consideration by the Faculty Human Ethics Advisory Group (HEAG). The HEAG recognised that the project complies with the National Statement on Ethical Conduct in Human Research (2007) and has approved it. You may commence the project upon receipt of this communication.

The approval period is for three years. It is your responsibility to contact the Faculty HEAG immediately should any of the following occur:

- Serious or unexpected adverse effects on the participants
- Any proposed changes in the protocol, including extensions of time
- Any changes to the research team or changes to contact details
- Any events which might affect the continuing ethical acceptability of the project
- The project is discontinued before the expected date of completion.

You will be required to submit an annual report giving details of the progress of your research. Failure to do so may result in the termination of the project. Once the project is completed, you will be required to submit a final report informing the HEAG of its completion.

Please ensure that the Deakin logo is on the Plain Language Statement and Consent Forms. You should also ensure that the project ID is inserted in the complaints clause on the Plain Language Statement, and be reminded that the project number must always be quoted in any communication with the HEAG to avoid delays. All communication should be directed to sandra.dunoon@deakin.edu.au.

The Faculty HEAG and/or Deakin University Human Research Ethics Committee (HREC) may need to audit this project as part of the requirements for monitoring set out in the National Statement on Ethical Conduct in Human Research (2007).
If you have any queries in the future, please do not hesitate to contact me.

We wish you well with your research.

Kind regards

Sandra Dunoon
Secretary, Human Ethics Advisory Group (HEAG)
Faculty of Science and Technology
Ph: +61 3 522 72270 Fax: +61 3 522 72539
E-mail: sandra.dunoon@deakin.edu.au
Cc Michael Hobbs and Sophie Nichol

Plain Language Statement for Student Survey

Date:

Full Project Title:

Principal Researcher: Dr Michael Hobbs
Student Researcher: Greg Bowtell
Associate Researcher(s): Sophie Nichol

This Plain Language Statement and Consent Form is 7 pages long. Please make sure you have all the pages.

1. Your Consent
You are invited to take part in this research project.

This Plain Language Statement contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project so that you can make a fully informed decision whether you are going to participate.

Please read this Plain Language Statement carefully. Feel free to ask questions about any information in the document. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, you will be asked to mark the consent checkbox. By doing so, you indicate that you understand the information and that you give your consent to participate in the research project.
2. Purpose and Background

This project is a portion of a Ph.D project and the aim of this study is to collect data and opinions from members of the Australian games industry, members of tertiary institutions that offer game design and development qualifications and students of those courses, in order to determine the current state of the industry and its future.

Based on industry opinion, games development degrees are (allegedly) failing to adequately service the industry in terms of producing adequately prepared graduates. Previous experience and a related research project forms the basis of this project.

You are invited to participate in this research project because of your current enrolment in a game development course.

The results of this research may be used to help researcher Greg Bowtell to obtain a Ph.D.

3. Funding

This research is totally funded by Deakin University.

4. Procedures

Participation in this project will involve:

- Completing a short online questionnaire consisting of 15 questions designed to gauge student knowledge levels about the game development industry. The questionnaire should take no more than 10-15 minutes to complete.

- Commitment is limited to completing the online questionnaire.

- The research will be monitored through checking for and extracting completed questionnaires as they are submitted.

5. Possible Benefits

Possible benefits include improved quality of graduates, improved dialogue between universities and developers, improved practice and procedure in both industry and university as a result of this dialogue. We cannot guarantee or promise that you will receive any benefits from this project.

6. Possible Risks

The information gained will be securely kept once obtained and will be privy only to those who are directly involved in the research, thus mitigating any possible risk.

7. Privacy, Confidentiality and Disclosure of Information

Any and all data and information collected will be securely maintained in either electronic or physical form. Electronic data and information obtained as a result of this study will be securely kept in a password protected folder on a single PC, itself located on Deakin Burwood property specifically in the office of Sophie Nichol, a supervisor of this research. Electronic data will be identified with non-descript numeric file names. Physical hardcopies of information obtained as part of this research will more than likely not be required, but if they are, they will be kept in a locked filing cabinet within the office of Sophie Nichol, who will be the only person with a key to the cabinet. Data or information obtained will be kept at Deakin for a minimum of 6 years after final publication before being destroyed.

Any information obtained in connection with this project and that can identify you will remain confidential, though you are not required to identify yourself at any point. It will only be disclosed with your permission, subject to legal requirements. If you give us your permission
by marking the consent checkbox, we can discuss the results with you though as stated, no identifying information will be collected.

In any publication, information will be provided in such a way that you cannot be identified. Confidentiality will be maintained through changing names where used of either individuals or companies. Any data acquired as a result of the study will at this stage be used for the related research project only and no other purpose.

8. Results of Project

Once the project has been completed, a copy of the thesis can be provided if desired and any possible publications that may arise from this research, while not planned at this stage, will also be provided if desired.

9. Participation is Voluntary

Participation in any research project is voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage until the data is processed or any identifying details are removed. Since you will not be identifiable it is not possible to withdraw the obtained data.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with Deakin University.

Before you make your decision, a member of the research team will be available to answer any questions you have about the research project. You can ask for any information you want. Sign the Consent Form only after you have had a chance to ask your questions and have received satisfactory answers.

If you decide to withdraw from this project, please notify a member of the research team or complete and return the Revocation of Consent Form attached. This notice will allow the research team to inform you if there are any health risks or special requirements linked to withdrawing.

10. Ethical Guidelines

This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

The ethics aspects of this research project have been approved by the Human Research Ethics Committee of Deakin University.

11. Complaints

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Executive Officer, Human Research Ethics Committee, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7123, Facsimile: 9244 6581; research-ethics@deakin.edu.au.

12. Reimbursement for your costs

You will not be paid for your participation in this project.
13. Further Information, Queries or Any Problems

If you require further information, wish to withdraw your participation or if you have any problems concerning this project (for example, any side effects), you can contact the principal researcher or

The researchers responsible for this project are:

*Greg Bowtell (PhD student)*
*Sophie Nichol*
*Dr Michael Hobbs*

*School of Engineering and Information Technology*

*Address:* 221 Burwood Highway, Burwood, Victoria, Australia, 3125

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### Plain Language statement for industry survey

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**Date:**

**Full Project Title:**

**Principal Researcher:** Dr Michael Hobbs

**Student Researcher:** Greg Bowtell

**Associate Researcher(s):** Sophie Nichol

This Plain Language Statement and Consent Form is 7 pages long. Please make sure you have all the pages.

14. Your Consent

You are invited to take part in this research project.

This Plain Language Statement contains detailed information about the research project. Its purpose is to explain to you as openly and clearly as possible all the procedures involved in this project so that you can make a fully informed decision whether you are going to participate.

Please read this Plain Language Statement carefully. Feel free to ask questions about any information in the document. You may also wish to discuss the project with a relative or friend or your local health worker. Feel free to do this.

Once you understand what the project is about and if you agree to take part in it, you will be asked to sign the Consent Form. By signing the Consent Form, you indicate that you understand the information and that you give your consent to participate in the research project.
You will be given a copy of the Plain Language Statement and Consent Form to keep as a record.

15. Purpose and Background
This project is a portion of a Ph.D project and the aim of this study is to collect data and opinions from members of the Australian games industry and members of tertiary institutions that offer game design and development qualifications in order to determine the current state of the industry and its future.

A total of 10 people will participate in this project.

Based on industry opinion, games development degrees are (allegedly) failing to adequately service the industry in terms of producing adequately prepared graduates. Previous experience and a related research project forms the basis of this project.

You are invited to participate in this research project because of your position in the Australian games industry or Australian tertiary institution.

The results of this research may be used to help researcher Greg Bowtell to obtain a Ph.D.

16. Funding
This research is totally funded by Deakin University.

17. Procedures
Participation in this project will involve:

- Completing a short online questionnaire consisting of approximately 17 questions designed to gauge industry and educational opinion. The questionnaire should take no more than 10-15 minutes to complete.

- Commitment is limited to completing the online questionnaire.

- The research will be monitored through checking for and extracting completed questionnaires as they are submitted and ensuring any voice recording derived from interviews are adequately secured.

18. Possible Benefits
Possible benefits include improved quality of graduates, improved dialogue between universities and developers, improved practice and procedure in both industry and university as a result of this dialogue. We cannot guarantee or promise that you will receive any benefits from this project.

19. Possible Risks
The information gained will be securely kept once obtained and will be privy only to those who are directly involved in the research, thus mitigating any possible risk.

20. Privacy, Confidentiality and Disclosure of Information
Any and all data and information collected will be securely maintained in either electronic or physical form. Electronic data and information obtained as a result of this study will be securely kept in a password protected folder on a single PC, itself located on Deakin Burwood property specifically in the office of Sophie Nichol, a supervisor of this research. Electronic data will be identified with non-descript numeric file names. Physical hardcopies of information obtained as part of this research will more than likely not be required, but if they are, they will be kept in a locked filing cabinet within the office of Ms Sophie Nichol, who will
be the only person with a key to the cabinet. Data or information obtained will be kept at Deakin for a minimum of 6 years after final publication before being destroyed.

Any information obtained in connection with this project and that can identify you will remain confidential. It will only be disclosed with your permission, subject to legal requirements. If you give us your permission by signing the Consent Form, we can to discuss the results with you.

In any publication, information will be provided in such a way that you cannot be identified. Confidentiality will be maintained through changing names where used of either individuals or companies. Any data acquired as a result of the study will at this stage be used for the related research project only and no other purpose.

21. Results of Project

Once the project has been completed, a copy of the thesis can be provided if desired and any possible publications that may arise from this research, while not planned at this stage, will also be provided if desired.

22. Participation is Voluntary

Participation in any research project is voluntary. If you do not wish to take part you are not obliged to. If you decide to take part and later change your mind, you are free to withdraw from the project at any stage until the data is processed or any identifying details are removed. Since you will not be identifiable it is not possible to withdraw the obtained data.

Your decision whether to take part or not to take part, or to take part and then withdraw, will not affect your relationship with Deakin University.

Before you make your decision, a member of the research team will be available to answer any questions you have about the research project. You can ask for any information you want. Sign the Consent Form only after you have had a chance to ask your questions and have received satisfactory answers.

If you decide to withdraw from this project, please notify a member of the research team or complete and return the Revocation of Consent Form attached. This notice will allow the research team to inform you if there are any health risks or special requirements linked to withdrawing.

23. Ethical Guidelines

This project will be carried out according to the National Statement on Ethical Conduct in Human Research (2007) produced by the National Health and Medical Research Council of Australia. This statement has been developed to protect the interests of people who agree to participate in human research studies.

The ethics aspects of this research project have been approved by the Human Research Ethics Committee of Deakin University.

24. Complaints

If you have any complaints about any aspect of the project, the way it is being conducted or any questions about your rights as a research participant, then you may contact:

The Executive Officer, Human Research Ethics Committee, Deakin University, 221 Burwood Highway, Burwood Victoria 3125, Telephone: 9251 7123, Facsimile: 9244 6581; research-ethics@deakin.edu.au.

Please quote project number EC [number] -2007.
25. **Reimbursement for your costs**
You will not be paid for your participation in this project.

26. **Further Information, Queries or Any Problems**
If you require further information, wish to withdraw your participation or if you have any problems concerning this project (for example, any side effects), you can contact the principal researcher or

The researchers responsible for this project are:

- Greg Bowtell (PhD student)
- Sophie Nichol
- Dr Michael Hobbs
- **School of Engineering and Information Technology**

**Address:** 221 Burwood Highway, Burwood, Victoria, Australia, 3125