



ISIS - Interactive Skills Integration Scheme: Evaluation Report

August 2012

Greg Hearn, Dan Swan and Ruth Bridgstock
ARC Centre of Excellence for Creative Industries and Innovation

Researchers:

Greg Hearn
Dan Swan
Ruth Bridgstock

Partners:



Table of contents

Executive summary	3
Background to ISIS.....	5
Evaluation methodology.....	9
Evaluation of pilot integrations.....	11
Case studies.....	11
Comparative case design.....	12
Findings for pilot integrations.....	12
New South Wales pilot projects.....	13
Queensland pilot project.....	17
Victoria pilot project.....	21
Target and comparison group evaluation	25
Summary of outcomes for the pilot businesses.....	28
Evaluation of internships.....	31
Description of the internships.....	31
Internship processes: Set-up, management and relationships.....	31
Intern expectations and realities of the job.....	32
Skill development: IM specialist technical skills.....	33
Skill development: Transferable skills.....	33
Enhancement of employability.....	33
Contextualising ISIS internship with other tertiary internships.....	34
Discussion, key findings and recommendations.....	36
Interactive media a potential enabler of innovation in all industries.....	36
The employment dividend of embedding interactive media in industry sectors.....	38
Skill needs in the creative economy.....	39
Key findings and recommendations.....	40
References.....	44

Executive summary

At the commencement of the Interactive Skills Integration Scheme (ISIS) project in 2010, the effect of major structural change in the world economy was still being felt and the impact had been significant across the Australian games industry and workforce. Despite the sustained growth of new technologies and mobile applications development, commercial models could not cope with the relative strength of the Australian dollar, fluctuating international markets, and the resulting off-shore competition. With these challenges came limited capital injection and growth, and yet, the education sector continued to produce games graduates who were looking to enter the workforce. Despite the potential oversupply of graduates, industry voices still argued that there was a shortage in critical skills. ISIS was a response to these two connected challenges: the need to broaden the revenue base of games companies and the need to investigate problems in the relevant education systems.

Now, at the end of ISIS, almost two years later, the Australian games industry is forecast to reach \$2.5 billion by 2015, a compound annual growth rate of 9.5%. Globally, the interactive games market is expected to reach \$90.1 billion by 2015 (Brand, 2012). Moreover, the games industry can be seen as part of a much larger interactive media sector, which, while not immune to the challenges noted above, has a more diversified revenue base through services to other sectors and a larger employment footprint. ISIS has evolved during a period of turbulent change and we suggest, therefore, that the implications of ISIS may be projected onto a much larger canvas, beyond the games industry.

ISIS was funded in 2010 by the Commonwealth Department of Education, Employment and Workplace Relations, and later, the Victorian Department of Business and Innovation, to identify and pilot models for addressing workforce development needs in the Australian games and interactive media industries. ISIS a joint initiative of Australia's leading centres for creative industries research and business development: the Creative Industries Innovation Centre (CIIC) at the University of Technology, Sydney, the ARC Centre of Excellence for Creative Industries and Innovation (CCI), and Creative Enterprise Australia (CEA) at Queensland University of Technology.

The ISIS primary project objectives were to inform:

- ◇ Improved career outcomes for graduates
- ◇ Better equipped graduates to meet the needs of industry
- ◇ Take-up of interactive media services by firms in other sectors.

The evaluation used a comparative case study approach. Rich longitudinal descriptions of pilot projects were developed using three waves of interviews and other evidence sources. Comparison case studies of projects that applied for, but did not receive, ISIS funding were also developed over the same period, using pre-test and post-test interviews. Though less exhaustive, four internships embedded in the pilot projects were also examined in detail using case study logic. These were compared with broader research regarding internships in the tertiary education sector in Australia. This comparative case study approach allowed for the robust comparative assessment of key performance measures.

This evaluation report suggests that ISIS was very successful in meeting these objectives, and has established and documented case studies, learning experiences, and frameworks to enable interactive media innovations across all Australian industry sectors.

In addition to endorsing a number of recommendations made in the ISIS Final Project Report and the ISIS education report called Industry Engagement and Graduate Skills: A Report on Tertiary Courses in Interactive Media and Computer Games (2012), this evaluation report recommends the following:

- ◇ Students and education providers need to be made aware of opportunities in different industry sectors for interactive media graduates.
- ◇ Professional experience programs (e.g. internships) need to be expanded to include engagements with different industry sectors.
- ◇ Business and entrepreneurship training should be incorporated in interactive media degrees and other courses to enable graduates to capitalise on opportunities in niche sectors.
- ◇ Games and interactive media curricula should be reviewed so that students have some knowledge and experience of inter-industry collaborations before embarking on a capstone internship or project.
- ◇ A government funded competitive mentoring program should be established which links 50 final year students with the best creative talents in Australian IM companies.
- ◇ Evidence based interventions should be funded to further validate ISIS-like approaches to innovation in Australian industry through Australia's ARC Linkage and ARC Industry transformation HUBS and CRC programs.
- ◇ Relevant Australian professional associations should be funded to examine the potential of cross-sector opportunities and educate their membership in relation to this.

Background to ISIS

The Interactive Skills Integration Scheme (ISIS) was informed by a number of issues and opportunities affecting the Australian games industry and by opportunities for Australian industry generally.

Challenges and opportunities in the games and broader interactive media industry

Research by the ARC Centre of Excellence for Creative Industries and Innovation (CCI) identified that the games industry in Australia has had both a number of competitive advantages (e.g. lower production costs, pockets of excellence, online gaming expertise, and cultural similarities with the Western games market), as well as a number of challenges (staffing difficulties such as skills shortages and lower salaries, low levels of intellectual property (IP) creation and ownership, reliance on international publishers, and geographical remoteness). The games industry has operated in an international environment that is experiencing a lot of turbulence in the types of games developed, the development process, revenue models, player demographics, and the skills required by workers (Haukka, 2011).

At the commencement of ISIS in 2010, the effect of major structural change in the world economy was also still being felt and the impact had been significant across the Australian games industry and workforce. Despite the sustained growth of new technologies and mobile applications development, commercial models could not cope with the relative strength of the Australian dollar, fluctuating international markets, and the resulting off-shore competition. With these challenges came limited capital injection and growth, and yet, the education sector continued to produce games graduates who were looking to enter the workforce. Despite the potential oversupply of graduates industry voices still argued that there was a shortage in critical skills.

Fast forward to 2012, and the Australian games industry is now forecast to reach \$2.5 billion by 2015, a compound annual growth rate of 9.5%. Globally, the interactive games

market is expected to reach \$90.1 billion by 2015 (Brand, 2012). Moreover, the games industry can be seen as part of a much larger interactive media sector, which, while not immune to the challenges noted above, has a more diversified revenue base and a larger footprint. For example, data from the Australian Bureau of Statistics (ABS) shows that, as at June 2007, there were 45 digital games development businesses in the interactive entertainment industry, employing 1,431 workers (Screen Australia, 2011). During the same period, there were 169,662 people employed in the Software and Digital Content workforce, accounting for 39.8% of the total Creative Workforce (Higgs, Cunningham, & Pagan, 2007). Approximately 36,000 people, representing 21.4% of the segment's workforce, were employed in specialist software and digital content occupations within creative businesses. A significantly larger number, 82,000 were engaged in business support roles, such as management and sales, within these specialist service providers. Another 52,000 people in specialist software and digital content occupations were embedded in other industries such as finance, government, education, and general business (Higgs, Cunningham, & Pagan, 2007).

As Higgs, Cunningham, and Pagan (2007, p. 30) point out, the CINMP paper, 'Australia's Creative Economy: Definitions of the Segments and Sectors' defines another, still broader, group of workers, which they called the Creative Digital Grouping. This grouping included "those activities involved in the production, creation and publishing of experiential and informational media that are currently being (or soon will be) produced, delivered, or experienced in digital form". Included in the definition are the 'software' based services and applications that enable or assist in these production, management, publishing, and consumption activities. Higgs, Cunningham, and Pagan (2007) suggest that some 330,000 people are employed in creative and support roles in creative firms and as embedded creatives in other industries in this category. **We suggest, therefore, that the implications of ISIS may be projected onto a much larger canvas, beyond the games industry.**

Challenges in the games industry skill ecosystem

Nevertheless, ISIS was particularly interested in the fact that the Australian games industry has often identified timely access to appropriate skills and the work-readiness of its entry-level workforce as impediments. Haukka (2011) points out that because Australian industry is vulnerable to international trends, it requires a highly mobile and flexible workforce. It requires skilled workers who can be found and engaged quickly when opportunities arise, but it also needs the flexibility to downsize when opportunities contract. Companies in the games industry necessarily focus on their short-term workforce needs, stressing their need for work-ready graduates able to apply skills and training with relatively little 'on-the-job' training or work preparation. Haukka (2011) reported that 84% of industry respondents rated the currently available games courses 'highly ineffective'.

At the same time, however, universities and vocational education and training (VET) providers argue that their role is not to provide just-in-time skills training, but rather to prepare students for a longer career trajectory (Haukka, 2011). Also, for employees and contractors working in the games industry, there are increasingly significant periods of down-time (unemployment and under-employment) and major competition for project work to consider.

Embedded creatives in all industry sectors

CCI research suggests that these kinds of employment issues are mirrored in the creative industries more broadly (e.g. Cunningham, 2011; Cunningham & Higgs, 2009). However, the same research shows that, increasingly, creative workers are deploying their capacities in other sectors outside their core industry, as indicated above. A number of empirical studies from around the globe confirm that as many – if not more – creative workers in creative occupations are employed outside creative industries firms than inside creative industries firms (e.g. Andrews, Yeabsley, & Higgs, 2009; Freeman, 2007; Higgs, Cunningham, & Bakshi, 2008; Higgs, Freebody, Anderson,

& Cunningham, 2010). Furthermore, in most cases, these studies showed that the highest numbers of people in these embedded creative occupations worked in digital content and software. Mirroring this need for digital creative workers across all industries, growth in the provision of creative digital services to other industries is part of a longer-term, sharp growth of knowledge-intensive business services (e.g. Miles, 2005, 2008). The provision of creative digital services (including the creation and utilisation of middleware) is now recognised by Screen Australia as an important diversification strategy for the games industry (Screen Australia, 2011). Similarly, Australia's broadband strategy notes that "the use of networked, digital technology spreads across all industry sectors" (DBCDE, 2009, p. 3) The AIMIA/IBM 2009 Digital Services Index also noted the continuing rise of digital services to all industry sectors in Australia.

The opportunity: An enabler of innovation in other industries

One reason for the growth in creative digital services to other industries is that they are a driver of innovation. For example, CCI researchers Potts and Cunningham (2008, p.18) and Potts, Cunningham, Hartley, and Ormerod (2008), in their discussion of the economic significance of the creative industries, argue the creative economy is a set of economic processes that act on the economy as a whole to invigorate innovation-based growth. Innovation-based growth built on creative innovation carries with it the possibility of parallel growth in employment and it can be distinguished from productivity increases that come from reducing the number of workers employed (Hearn & Mandeville, 2005). Potts and colleagues argue that the creative economy needs to be understood as being integrated with all industries, rather than being as a sector in its own right. Consistent with the studies cited above, they see creative workers as being embedded in all sectors, not solely existing in the core creative industries. The heart of the creative economy is the production of new ideas that ultimately become new products, services, or even industry sectors, as well as process

or product innovations in older sectors. Potts (2012) argues that creative industries affect all phases of innovation: the creation, adoption, and retention of new products. Empirical support for this idea is found in a survey conducted by Muller, Rammer, and Truby (2009) of 2,000 European creative firms. The survey results showed that these companies drove innovation in a variety of other sectors through creative inputs, such as ideas for new products, supplementary products, and services or marketing support for product innovations. Software and advertising companies showed the strongest links to these innovations.

The ISIS project

ISIS was funded in 2010 by the Commonwealth Department of Education, Employment and Workplace Relations, and later, the Victorian Department of Business and Innovation, to identify and pilot models for addressing workforce development needs in the Australian games and interactive media industries. ISIS is a joint initiative of Australia's leading centres for creative industries research and business development: the Creative Industries Innovation Centre (CIIC) at the University of Technology, Sydney, the ARC Centre of Excellence for Creative Industries and Innovation (CCI), and Creative Enterprise Australia (CEA) at Queensland University of Technology.

The ISIS project's purpose is to address the unmet demands for labour and skills reported by the Australian games (and broader interactive media) industry so that the industry may take full advantage of new market opportunities created through innovative applications of interactive media to other industry and public sectors. The emphasis is not just on providing standard interactive media services, but is also on driving innovations in the host companies.

The ISIS proposition was to bring together key industry and education stakeholders and facilitators to develop, trial, and showcase strategies for addressing the education and training requirements for the skilled workforce necessary to extend applications of interactive

media beyond the games sector to the broader interactive media and other industries.

The ISIS project objectives were to inform:

- ◇ Improved career outcomes for graduates
- ◇ Better equipped graduates to meet the needs of industry
- ◇ Take-up of interactive media services by firms in other sectors.

ISIS project deliverables

To identify and pilot models for addressing workforce development needs, ISIS comprises two related 'streams' (education and the workplace/business) addressing workforce skills and business sustainability. The project's goals are improved preparation for professional practice in undergraduate education programs, leading to 'work-ready' graduates in interactive media, and improved management/business model skills of leading industry practitioners.

The research component of the ISIS project involves building and evaluating models of innovation, addressing the perceptions, problems, and challenges for industry, educators, and governments. The research focuses on the development of a critical evaluation framework for seedling interactive media ventures.

Education stream

- ◇ ISIS-sponsored student placements in interactive media firms.
- ◇ Guidelines for industry experience and case studies of successful placements, internships, and industry projects in higher education courses.
- ◇ Guidelines and resources for improving curricula, learning experiences and graduate outcomes in interactive media courses.
- ◇ Workshops bringing together leadership and forging new thinking and sustained relationships between industry and university educators.

Workplace sustainability stream

- ◇ ISIS instruments – resources (templates, toolkits, guidelines, ‘how to’ advice) for facilitating cross-sector engagement and investment in interactive media services, applications, and inventions.
- ◇ Case studies based on pilot projects involving interactive media firms providing applications, services, and/or technologies to firms and government agencies in other sectors.
- ◇ Management mentoring and masterclasses.

ISIS evaluations, research, resources, and dissemination

- ◇ International and Australian case studies from preliminary scoping.
- ◇ Stakeholder and participant evaluation workshops.
- ◇ Online dissemination of resource material created through ISIS.
- ◇ Report on the ISIS Project, including an arm’s length evaluation undertaken by the Research and Evaluation Team with recommendations.

Evaluation methodology

Rigorous comparative case study approach

The evaluation used a comparative case study approach. Rich longitudinal descriptions of pilot projects were developed using three waves of interviews and other evidence sources. Comparison case studies of projects that applied for, but did not receive ISIS funding, were also developed over the same period, using pre-test and post-test interviews. Though less exhaustive, four internships embedded in the pilot projects were also examined in detail using a case study logic. These were compared to research regarding internships in the tertiary sector in Australia. This comparative case study approach allowed robust comparative assessment of key performance measures.

Multiple sources of data

The following sources of evidence formed the basis of the comparative case study approach:

1. Formal in-depth interviews: These were conducted with participants, key stakeholders (management, coordinators) and business mentors.
2. Documentation: Data included documents submitted through ISIS (together with public records, annual reports, proposals, promotional materials, internal memos/ documents, press releases).
3. Surveys/questionnaires: These were used to assess the internships and were focused on specific internship outcomes informed by research in the field.
4. Informal observation: Members of the evaluation team attended a number of ISIS events (e.g. workshops; showcases, and so on).

A participatory learning approach

The ISIS Team managed the evaluation using a continuous, mutual learning and action-oriented process between project sponsor, project team, advisory group, project participants, and other stakeholders over a 2-year period. The process enabled the inclusion of a diversity

of perspectives, regular critical reflection, and active involvement by participants and stakeholders in the design and implementation of the evaluation. This overarching participatory evaluation (PE) model:

- ◇ Enabled the creation and sharing of practical new knowledge and innovative ideas for planning and policy making that could lead to more successful and sustainable outcomes.
- ◇ Provided useful, rigorous and grounded data for design, implementation, and ongoing evaluation, while taking the needs and goals diverse stakeholders into account.

Holistic integrative analysis of all aspects of ISIS

ISIS comprised an integrated program of activities designed to improve graduate and industry outcomes for Australia's interactive media industry. This included three pilot integrations, a mentoring program, development and application of an innovation toolkit, internships in each integration, and a survey of education providers. Our evaluation will consider each of these components, and how they integrated and informed one another in achieving specified outcomes.

Measures of Impact		
Impact of activity	Performance measures	Analysis and interpretation
Improved career outcomes for graduates Better equipped graduates to meet the needs of industry	Interviews and ratings by interns and interactive media and host companies (satisfaction with learning, professional experience, placements and communication with industry, and requisite skills) Workshops with educators industry leaders and students as a microcosm of the sector to discuss the ISIS education report findings	Compare participant and non-participant outcomes through cases studies of interns compared with extant literature on internships in the tertiary sector Contextualised by examination of the ISIS education survey and report and integrated with internship case studies
Take up of interactive media services by firms in other sectors	Relevant items (services demand; opportunities; relevance of interactive media) will be assessed by Delphi of advisory group and compared to secondary data of industry trends	Utilise advisory group to estimate likelihood of take up using Delphi methods and compare with secondary data
Proven impact among program participants compared with non-participants	Comparison of ISIS pilot case studies with non-participant case studies based on baseline and post-test measures of pilot projects and comparison projects drawn from unsuccessful applicants. Independent interviews with ISIS mentors in each state Independent expert assessment by industry innovation specialist	Compare participant and non-participant outcomes via comparative cases studies for the pilot programs Compare internships by comparing intern experiences with extant literature on tertiary internships
Use of resources; tools guidelines and learning experiences by project participants	Assessed by interviews as above	Exemplify use of resources via interviews with participants

Table 1 - Measures of impact for ISIS outcomes

Evaluation of pilot integrations

Case studies

The remit of the ISIS project was to create a set of tools that nurtured effective and mutually beneficial collaboration between ‘traditional’ business organisations and small innovative business from the interactive media industry. The ISIS project undertook a series of three inter-organisational integrations – case studies comprised of interactive media companies working with host companies in other sectors. These three projects formed a foundation for developing and testing a framework for the evaluation of the overall successes and failures of each innovation.

Case study selection criteria

Leading Australian firms and organisations were invited by ISIS through industry relationship networks and the ISIS public website¹, where expression of interest forms were also made available. Each interactive media company and host company was then reviewed, assessed, and matched (or in some cases, discarded) by the ISIS Selection Committee. The Committee consisted of the ISIS project director, Justin Brow, key representatives from QUT and UTS, together with the mentors identified for each project. Applicants submitted eligibility requirements, selection criteria, and an application form, which the committee reviewed to arrive at a shortlist. Final selection and one-to-one matching was arranged through interviews and meetings of the pilot business² with the interactive media team for selection. These documents are available through the ISIS collaboration website Basecamp³. The final mapping and selection of interactive media skills for each project integration (grouped regionally by state) and the vertical industry sectors can be found in Table 2 – ISIS target and comparison groups on page 12.

¹ <http://www.isisinteractive.net.au/>

² The pilot business provides cash funding for the ISIS project, whereas the interactive media team commitment is paid for by ISIS and the pilot business, hence the latter two parties have final veto on the selection as they provide funding.

³ <http://isis3.basecampHQ.com/>

Interview guide for Pilot Integrations

Semi-structured questions spanned six key areas:

1. Business Models
2. Dynamics of the cross-industry sector
3. Origins of linkages
4. The interactive media and organisational implications
5. Innovation
6. Skills, human resources, and human capital.

Interview schedule

Interviews were conducted for the pilot integrations as follows:

- ◇ Pre-test interview – conducted 2–6 weeks after the project commenced
- ◇ Mid-term interview – conducted at approximately 3–4 months
- ◇ Post-test interview – conducted upon completion of either the project or following the 6 month term.

Interviews were conducted with:

- ◇ Pilot businesses in Queensland, New South Wales, and Victoria
- ◇ Interactive media teams in Queensland, New South Wales, and Victoria
- ◇ Comparison pilot businesses and interactive media teams in Queensland, New South Wales, and Victoria.

In each case the interview was conducted with the business or unit leader, ISIS project leads, or both in some cases.

Mentors for each of the pilot integrations were also interviewed at post-test stages together with informal observations throughout the project.

Comparative case design

The comparative case design is depicted in Table 2.

ISIS	Integration 1 (NSW)		Integration 2 (QLD)		Integration 3 (VIC)	
ISIS Target Firm	UNE/ QuickSmart	Toggle Media/ Ark	GBI Mining	Zone4	Australian Turn-Tables (ATT)	Media Saints
ISIS Type	Target PB	Target IM	Target PB	Target IM	Target PB	Target IM
Sector	Education	Education/ Gaming	Mining Services	Visualisation	Manufacturing	Digital Services
Product/ Service	Product	Service	Product	Service	Product	Service
Size	Large/SME	Micro	SME	Micro	SME	SME
IM Skills	Low	High	High	High	Low	High

Comparison Firm	Ambitious Software	Ambitious Software	QLD Museum	Josephmark	Bendix	Current Circus
ISIS Type	Comparison PB	Comparison IM	Comparison PB	Comparison IM	Comparison PB	Comparison IM
Sector	Gaming	Gaming	Museum	Digital Services	Manufacturing	Gaming/Digital Services
Product/ Service	Product	Product	Service	Service	Product	Service/ Product
Size	Micro	Micro	SME	SME	MNC/SME	SME
IM Skills	High	High	Low	High	Low	High

PB = Pilot Business **IM** = Interactive Media

Table 2 - ISIS target and comparison groups

Findings for pilot integrations

An overall finding and outcome was the identification of benchmark phases that ISIS enabled. The diagram (1) below provides a guide to the phases where ISIS proved to be most effective, validated by each of the pilot projects participatory groups.

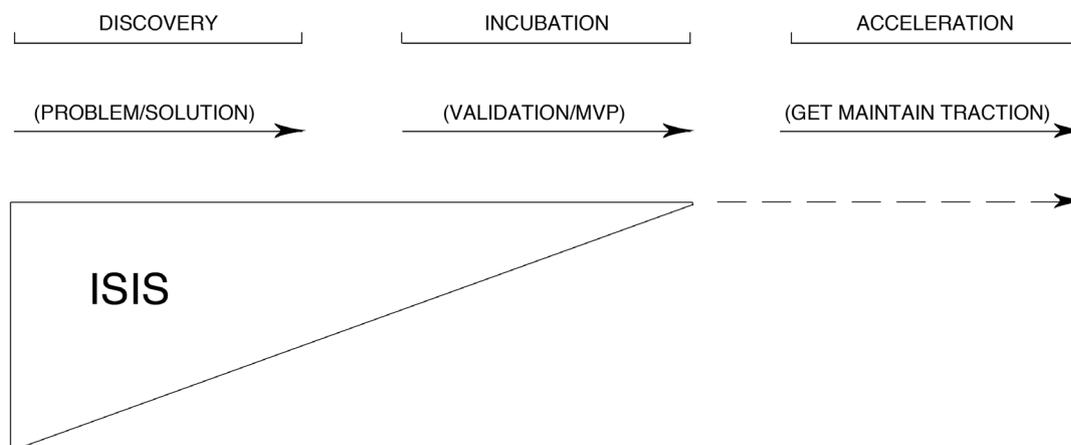


Diagram 1 - ISIS benchmark phases

The phases of discovery, incubation and acceleration were adopted as an evaluation approach provided initially by Lindegaard & Kawasaki (2010).

New South Wales pilot projects

New South Wales participatory groups:

Selected interactive media (IM) teams:

- ◇ Toggle Media – David Bartolo
- ◇ Ark Games – Dan Graf (also Comparison IM)

Selected pilot businesses:

- ◇ University of New England (UNE) – Lorraine Graham

Mentor

- ◇ Hamish Hawthorn – ATP Innovations

Non-selected pilot businesses (comparison group)

- ◇ Ambitious Software – Derek Proud (PB and IM)

NSW pilot integration

Discovery phase

Toggle Media, an Educational Digital Services company, was selected as the NSW interactive media (IM) team. It is worth noting that originally an additional IM team, Ark Games, were also selected to work alongside Toggle from the outset⁴. Toggle focuses on interactive face-to-face training materials online for education, not-for-profit, and corporate clients. They help clients understand changes in existing technology to leverage and reach their audiences, using turnkey or white-label solutions, particularly for clients who want to use technology for remote training. Toggle is a micro-business (fewer than five full-time or permanent staff) of three people and although the depth of individual experience is vast, the business is in its 'start-up' phase of development. ISIS presented the first

opportunity for Toggle to work in a collaborative partnership to bring interactive media skills to an organisation the size the ISIS pilot business: The University of New England (UNE). Through ISIS, Toggle's objectives were to develop a proof-of-concept valued by the client, as well as develop and maintain an ongoing relationship with them. ISIS provided Toggle with the opportunity to build a reputable brand name based on good work, from which they hope to grow into a small-to-medium (SME) business of 10–15 people. Through ISIS, Toggle have engaged with groups such as registered training organisations (RTOs), NSW Police, ABC, and not-for-profit organisations, forging cross-industry relationships with organisations outside the IM sector.

During the early stages of the pilot integration, ISIS promoted a process of discovery, critical for defining the achievable outputs of the project and setting client expectations. The ISIS toolkit, mentoring and, most notably, project meetings that were also fed into Basecamp, all proved useful cooperation and communication tools. 'Speaking the client's language' is an important aspect of Toggle's business practice, and this aligned well with ISIS's approach to the pilot integration, facilitating communication between technical and non-technical entities and vice versa. At the Discovery stage there were no organisational, structural, or cultural barriers to Toggle team members communicating with project people, allowing them to take an exploratory approach to defining project objectives. During the initial stages the only barriers to communication were the demanding schedules of all those involved.

Without ISIS, Toggle predicts that working relationships would have been slower to form as, being a micro-business, they have been unable to plan process change and innovation strategy to align with project deliverables. ISIS has helped Toggle take steps towards creating a prototype roadmap and broader innovation strategy similar to ISIS's own. For the discovery

⁴A change of circumstances with the personnel at Ark meant that they did not have the dedicated resources to work on the ISIS project full-time. As much of the early stage phases had been surrounding discovery (that is, problem definition and scoping) impact of their withdrawal from the project was minimal. Ark contributed to the initial pre-test stages as a target IM of the evaluation, and since they were no longer directly involved with ISIS NSW pilot integration they later contributed with post-test stages as a comparison IM group.

phase in particular, it was important that this included a formal process of relationship building with the external organisation, both inclusive and exclusive of their sector. Toggle defines innovation as products or services that haven't been created before, including features and adding value. Start-up companies are their most innovative early in their evolution, when they are nimble and adapt readily to new environments. Toggle embraced the opportunity to develop new ways to work with a much larger organisation with unfamiliar language and expectations.

For the NSW pilot integration, Toggle Media was matched with The University of New England (UNE) 'SiMERR' group, part of The National Centre of Science, Information and Communication Technology, and Mathematics Education for Rural and Regional Australia located in Armidale, NSW (also a pilot catchment for the Federal Government's NBN roll-out).

The target project for ISIS was SiMERR's 'QuickSmart' research program, which has developed a product aimed at improving literacy and numeracy for underachieving school students. Through ISIS, UNE began by exploring 'QuickSmart in the Home', a concept that brings their existing and successful skills programs (such as the 'Flash Card' kit) to parents or carers at home, using interactive media gaming techniques.

QuickSmart relies on grants and public funding projects (such as NBN). With Federal funding, UNE and SiMERR have been trying to grow QuickSmart's online reach and, through the ISIS program, the SiMERR team have been able to explore the commercialisation of QuickSmart online. This transformation relies on working with other industry groups (particularly interactive media teams). Hitherto, experience outside the SiMERR group was limited to external schools, and Research Services at UNE.

Only one element of QuickSmart (numeracy) was developed with ISIS, but the project could extend to more programs (i.e. literacy). At an early stage of the pilot integration, UNE and SiMERR were able to broaden QuickSmart objectives beyond that which were initially proposed to ISIS. Without ISIS, SiMERR would have had narrower goals, employed a consultant, or relied on limited internal expertise, suppliers, and networks. ISIS catapulted the QuickSmart vision into different areas (such as interactive media) and provided a platform for communication and problem-solving, where teamwork and collaboration have bloomed. Collective meetings were exciting, connecting the SiMERR and UNE teams to creative digital people and ideas, and taking their work into new fields. The ISIS Basecamp online tools proved useful for extending and consolidating these ideas and relationships, with teams from Armidale and Sydney, some 470 kilometres apart, collaborating free of geographical constraints.

QuickSmart creates more demand than SiMERR and UNE can service. UNE saw ISIS's role as building SiMERR's capacity to innovate and cope with demand by leveraging the broadband connectivity of the NBN. QuickSmart maintains a huge database of qualitative and quantitative results gathered through institutional research measures. This includes school surveys as a continual source of feedback (handwritten from QuickSmart audience and customers i.e. teachers, parents and kids); and NAPLAN (National Assessment Programs for Literacy and Numeracy – a national test on school children in years three, five, seven, and nine) data.

Through ISIS, SiMERR identified the need to grow capabilities and extend relationships where skills have been spread too thin. The SiMERR team have limited interactive skills to develop QuickSmart online. And skills gaps identified during ISIS may help inform future staffing.

Incubation phase

Toggle identified that they had the necessary personnel and skills to achieve their goals during the very early stages of the incubation phase: their view was that they were small enough to react quickly and without internal conflict. Toggle was formed around the structural metaphor of ‘three pieces of the pie’ — the three founders’ skills, interests and experience integrated into the company as a whole. It is known in the sector that working with large organisations, such as TAFE, with bureaucratic structures, can inhibit project outcomes. This encouraged Toggle to focus their work on bridging skills gaps, an approach they identified as relevant for the ISIS pilot integration. Through discovery and a number of incubation stages this also presented challenges, which Toggle managed by maintaining their ‘nimble’ approach.

During the initial stages of the discovery phase Toggle had to adapt quickly to the loss of partners Ark Games, which presented additional skills gaps for project validation and delivery of prototyping. During the incubation stage, Toggle were able to adapt to the changing requirements and skills needed for validation and prototyping development by engaging contract consultants, as well as student placements provided through ISIS and UTS. While these unexpected management overheads were taxing for Toggle, structural changes within the company (in terms of key personnel) have been minimal. Toggle’s nimble and lean approach was successful during the delivery layer – enabling them to scale delivery skills up or down where required.

The key challenge for Toggle was maintaining resources to match the project demands alongside cash flow. Although ISIS guaranteed funding, the additional contractual complexities added by UNE and ISIS joining in a broader program of funding resulted in an unanticipated mismatch of payment schedules. As a result, expenses to Toggle (by UNE) were delayed. This experience provides an important learning for institutions engaging micro-businesses, as delays in project funding can affect overall project deadlines. In this case, ISIS provided

sufficient mediation to limit project impact and mitigated strain on working relationships. Progression from the discovery phase was complicated by a change of deliverables: from extending QuickSmart online for children, to growing QuickSmart online for adults. This change of focus was due to SiMERR’s response to funding body demands and opportunities to extend QuickSmart’s brief into a new area of adult education to assist unemployed jobseekers.

ISIS also leveraged connections with NBN initiatives, providing wider exposure to a broader program of funding, and this broader strategy needed to be integrated with ISIS deliverables and milestones. Broadening also brought additional stakeholders, which, added to an organisation of over 350 full-time employees (FTEs) increased the burden on Toggle’s team of three FTEs. This, combined with managing cash-flow, meant that Toggle were inundated with technical requests and client management overheads. With ISIS mentoring, Toggle were able to manage these challenges and provide highly-detailed functional specification documentation for the program of work. They were also able to adapt their screen mock-ups of the product into clickable prototypes to reproduce the visual elements of ideas and concepts proposed for QuickSmart.

As a result of ISIS, UNE and SiMERR realised the outcome of years of research: A faithful online translation of QuickSmart. For UNE and SiMERR, the outcome they received as a result of ISIS was a manifestation of years of research and a validation of the basic need for numeracy and literacy support in the community. They have been testing concepts in a number of schools, but are yet to be proven (or tested) fully in the adult market. Full data feedback and results of proof-of-concept testing are yet to be fully received; however, signs so far have been encouraging. As a result of additional funding for a formal product in a national adult numeracy learning setting, SiMERR is expecting a planned launch of a ‘MVP’ (Minimal Viable Product) early next year, in line with government deadlines.

As well as feedback on prototypes and the expansion from child to adult learning, subsequent phases will also extend to include literacy and other learning modules. SiMERR Directors have been thrilled to participate in ISIS and are pleased with the outcomes of ISIS, in that not only do they have viable outcomes of the project – detailed functional specifications and proof-of-concepts that are testable – they have also been able to extend their research, the reach of QuickSmart into new sectors, and develop a formal product with national government support. Part of the processes learned through ISIS will be carried through into all the stages of the programme of development.

Through ISIS, UNE and SiMERR's confidence that the integrity of QuickSmart can be faithfully translated online through interactive media, and developed beyond their initial aspirations for ISIS into a broader body of work and a minimal viable product (MVP is a specific deliverable for early 2013) has also grown. The growth in confidence has also been a result of diligence in the validation process and a strong set of functional specifications. The validation process provided not only a common language needed to engage with interactive media teams, but also the skills to articulate problems and solutions, not in technical (e.g. IT) terms but within their educational expertise.

ISIS exceeded expectations to the extent that that now, through ISIS and the integration of new techniques in game-play, UNE hopes develop new tools to bring to the sector. Although it is too early to assess the next (acceleration) stage explicitly, it is expected that the relationship between UNE and Toggle will continue deep into the next phases of the QuickSmart program. In addition, UNE and SiMERR have gained skills in confidently working with IM and IT professionals. Toggle have also learned key skills, managing projects with larger organisations as well as developing the company around a successful case-study that help them win new business. Both have achieved commercial outcomes, and the QuickSmart product has revealed new commercial applications, such as education in

the mining sector, and may indeed break away from UNE into its own commercial entity in future.

Queensland pilot project

Queensland participatory groups:

Selected interactive media (IM) teams:

- ◇ Zone 4 – Thom Saunders

Selected pilot businesses:

- ◇ GBI Mining – Graham Lumley CEO and Trevor Trott, COO

Mentor

- ◇ Sonya Henderson-Edbrooke – Enterprise Connect

Non-selected pilot businesses (comparison groups)

- ◇ Queensland Museum – Michael Westaway (PB)
- ◇ Josephmark – Carl Watney (IM)

Queensland pilot integration

Discovery phase

Zone4, the IM team for the Queensland pilot integration, focuses on traditional industries that have problems sharing information (such as large data sets) with their clients. As a micro-business (fewer than five full-time staff) Zone4 offers fee-for-service tools and methodologies in data visualisation, overall user interface, user experience, and content creation. Currently, the Zone4 business proposition is quite broad and dominated by fee-for-service engagements. Their customers generally seek to expand the reach and accessibility of data, exploit existing data assets, and add value. Zone4 works across multiple sectors, including TV and entertainment, as well as the mining sector.

ISIS helped Zone4 complete a project with a large data-set, and it is hoped that the ISIS project will function as a case study and model for other cross-industry projects. Zone4's goals

were to forge an ongoing relationship with GBI Mining, to develop a subscription-based business model with benchmarking data, and to build an ongoing relationship with ISIS. Zone4's future business goal is to create a spin-off company focusing on visualisation IP, and to further develop and expand the offering of their visualisation platform as a subscription model to cross multiple sectors, moving away from fee-for-service and attracting investment from big players such as Adobe, IBM, or Microsoft.

During the discovery phase of the pilot integration, ISIS helped identify engagement problems. In the past, Zone4's engagement processes had been limited by time and budget constraints, particularly the capital investment needed for cross-industry information exchange and knowledge transfer. The opportunity to expand their research and development (R&D) through the formal structure provided by ISIS was critical to Zone4's goals of creating ongoing relationships based on product creation (as opposed to a more commoditised approach associated with fee-for-service). Without ISIS, Zone4 would have continued their fragmented approach to R&D, funded and executed through individual projects, and Zone4's ultimate 'visualisation platform' goal would have required additional funding from leveraging assets through bank capital. Zone4 also believes that without ISIS they would have had limited resources to further develop their innovation stream as a separate and formal process (such as the ISIS innovation process and prototype funding) that the business hopes to adopt as part of its strategy and practice. ISIS was also able to broker a relationship between Zone4 and GBI by identifying cultural compatibilities and aligning relationships, business processes, and outcomes.

A tangible example of ISIS's role in relationship building was their recommendation that both businesses seek legal advice on the IP brought to the project, the IP created through ISIS, and the IP that fell outside of these two groups⁵. From an operational point of view, GBI and Zone4 wanted to tackle any potential problems of IP ownership, which they viewed

⁵Discussion and negotiations around legal advice has begun between Zone4 and GBI in the form of a separate 'joint venture'.

as crucial, from the start. Zone4 believes that ISIS's approach could become a tool or device in itself, helping small businesses better commercialise. Zone4 was also acutely aware of language issues inherent in visualisation as a method, which ISIS identified as both an opportunity and a challenge. ISIS mentors' experience in innovation and commercialisation was integral to the discovery process.

GBI Mining (GBI) was the pilot business for the ISIS Queensland integration matched with Zone4. GBI is a data services company for the mining industry, specialising in providing insights into mining equipment productivity, benchmarking, and analysis of people, performance, and potential productivity. Among their key differentiators is data reliability and in-depth chronological data analysis for value feasibility studies and evaluation plans. As an SME of around 15 FTEs, GBI have limited capacity to innovate in-house. GBI recognised that resources, knowledge, and investment needed to be expanded. For example, IT expertise is confined to the vital role of database administration (DBA), and although passionate about innovation, the database administrator has to focus on paid-work. GBI's current annual growth projections are between 15–20%, a rate the company hopes will continue despite the view internally that the mining sector may have peaked. In addition to fiscal growth, a general goal for the GBI business model is to balance business peaks and troughs.

GBI defined success as achieving a deliverable and demonstrable product, not just a process. This success would help open up GBI services, improve efficiency, gain repeat business and maintain the value of the GBI brand. GBI had a specific business problem identified for the ISIS project: GBI produces very detailed and precise paper-based reports to their mining sector clients. The quality and depth of these reports are beyond question, and can help their clients increase productivity into billions of dollars. However, due to the detail and size of the reports, they can be inaccessible and ineffective for communicating key learnings to vital team members (i.e. on-site supervisors, payload

drivers, etc.) beyond the first reading audience (i.e. senior managers). The solution conceived through ISIS was an interactive media data visualisation tool to enable users to transform data into concise and manageable reports in the form of visual graphics.

GBI has previously engaged with other groups outside their industry to investigate possible approaches, such as business coaches, consultants, and more recently Enterprise Connect, which introduced them to ISIS. An unknown challenge for Zone4 was that GBI have previously engaged with a possible solution – project 'Jellyfish' – a back-end product to assist on-site supervisors with methodology. GBI partnered with a mine and took the project to the prototype stage, however the mine changed its processes and so abandoned the prototype, losing GBI in excess of \$100k. The user-interface components of the prototype were undertaken by a six-month contract worker, and there was also concern that internal development by a contract worker carried no guarantees for deliverables, nor enough creative ideas. At the discovery stage, ISIS encouraged GBI to improve the structure of their decision making process, a valuable step since, as a small business, GBI tended to react according to demand. Without ISIS, GBI would have pursued the same project but would have outsourced the required work.

CEO Graham Lumley was responsible for strategy and the key driver for connecting with ISIS. Also supported also by the COO, GBI had a clear vision for their product, but were unsure how to get there, and based on previous experiences wanted to build a relationship and partnership to overcome issues by consensus.

During the ISIS selection process, GBI preferred Zone4 for more than their skills: they were compatible in terms of size, ambition, culture, and also wanted to develop a long-term relationship. While GBI were not afraid to take risks to innovate, ISIS helped the company engage in research and development with some degree of security. The established GBI offering was based around innovation – providing knowledge through data services that

companies don't have – and commodification of that business model had not been successfully explored. Although existing IT skills were expected to be enhanced through ISIS, GBI identified that they were prepared to hire new staff if needed. Co-operation between strategy and operations is something that GBI sought to replicate through the ISIS collaboration, so the strategic roadmap with Zone4 had to go beyond good communication and extend to deliverables.

Incubation process

For Zone4, the discovery phase caused no significant structural change to their organisation other than the joint venture agreement with GBI, a realignment of the pilot integration project goals, IP ownership, and licensing model. This enabled Zone4 to develop alongside GBI and validate the overall prototype approach and business model. Zone4 took their customised Agile model in combination with a 'lean development'⁶ approach to the customisation of their visualisation platform to suit the needs of GBI (referred to here as the ISIS prototype). This approach allowed Zone4 to deliver iteratively, so that GBI could test and assess in very specific stages. By setting these as deliverables alongside ISIS milestones, results were delivered quickly and aided both the businesses to work with very little conflict (language issues are typically expected when working with data and visualisation). Both ISIS and mentor Sonya Henderson-Edbrooke from Enterprise Connect (who helped set expectations during the discovery phase, and shared her experience in the field) played large roles in the project's success.

The visualisation tool is an operational product that connects with GBI's backend data. It allows deep analysis and data mining through visual tools and techniques. One of the unique challenges that Zone4 were able to overcome was the notion of 'factoring' which is a manual method that GBI employs to validate data collection based on certain attributes and variables. By reproducing these assumptions

within the visualisation tool, Zone4 believe that their ISIS product provides a very clear solution to GBI's problem: providing added value to GBI data and access to GBI data sets. Solving the original problem of access to the data also revealed new, less tangible problems that were solved as Zone4 developed new mathematical models. These models and algorithms can also be developed in later project stages and helped GBI reduce elements of their operational overheads associated with data management.

Zone4 have been delighted with the ISIS outcomes: they have achieved their goals of developing tangible IP and forming a long-term, joint venture with GBI. They see ISIS as a model for bringing two companies together through investment (or investors) and one which they would like to see pursued by companies seeking to move beyond fee-for-service engagements in future. As well as helping GBI roll out the visualisation tool, in part through MINExpo, Zone4 have also been talking with other sectors and companies that may take up the tool. For example, by showcasing the ISIS work, they hope to work with an environmental engineering group providing visualisation and modelling for weather data. ISIS has helped stabilise their business, not only via tangible outcomes but also through rigid processes of delivery. ISIS has also helped to confirm their direction of a development for licence model.

GBI's business model underwent significant structural change as a result of the ISIS project. The discovery stages helped move their business beyond a services and consultancy model to the creation of an entirely new business division called GBI Data. In the initial stages, GBI's goal was to open up their services, but this progressed to significant organisational change. Through the iterative development process, GBI's understanding of Zone4's solutions improved and, as the ISIS outcome became much more apparent, so did broader possibilities, and GBI recognised that ISIS could give them a framework and an engine for their whole product. Working very closely with the Sonya Henderson-Edbrooke,

⁶Also known as 'lean software development' this approach was developed from the Agile methodology community and principles to develop tools and prototypes very quickly while minimising waste, or 'churn'.

a licensing model was developed and then validated through an external consulting group, Johnston-Rourke (www.jr.com.au). GBI's new independent division, GBI Data, will continue to develop the data and toolset with Zone4, and licensing of the tools will provide a revenue stream, supported initially through the consulting side of GBI. As the tools develop and business grows, it is conceivable that GBI Data will become the core business, and GBI a more globally scalable company as a whole. International growth will also mean that GBI gains expertise with new data sets and new markets (for example, data is primarily from Australia and 'above-ground' mining, while data in Asian markets is primarily for below-ground mining).

The first next steps for GBI and the ISIS project will be an official launch at the MINExpo event in Las Vegas this year. Zone4 will be attending and providing support as a stakeholder in the new company. The initial project stages will have both a public product and also a private product – the latter to recruit product champions who will form the user group for the next phase. Following MINExpo, GBI are planning a road show in the US to showcase the ISIS product as part of a broader sales and marketing program of work. This will also include on-site training and product support. It is hoped that the ISIS product will increase revenue up by \$3 million over the next three years. During the incubation stages, GBI talked with several leading blue-chip firms (e.g. Rio Tinto, Caterpillar) in the mining industry to validate their approach. It is also of note that in terms of timing, as predicted, GBI foresaw a downturn/slowdown in the mining sector, which also increases the demand for GBI data services. ISIS has exceeded GBI's expectations, not only providing a great product outcome, but building this into a commercialised product, which has been highly valuable. As the product becomes more and more commercially proven, GBI will hire more workers to meet demand. In the meantime they are relying on Zone4 to provide the additional skills that may be required.

Victoria pilot project

Victoria participatory groups:

Selected interactive media (IM) teams:

- ◇ Media Saints – Per Bredenberg

Selected pilot businesses:

- ◇ Australian Turntable Company – Ben Chapman

Mentor

- ◇ Simon Curry – Galbraith and Co.

Non-selected pilot businesses (comparison groups)

- ◇ Bendix – Ian Bott (PB)
- ◇ Current Circus - Yossi Landesrocha (IM)

Victoria pilot integration

Discovery phase

Media Saints, the Victoria Pilot Integration IM company, are a media services company specialising in gaming, video production, and digital media development. Media Saints brings digital industry skills to non-industry sectors through consultancy, with clear methodology and development processes. Their goal was a specific six-month development program through ISIS which they hoped would provide a showcase to build a longer term relationship with their partner, ATC and allow them to expand into government sectors. Their medium to long term goal was to separate the business into distinct services (consultancy) and product organisations (the latter owning IP).

Media Saints' cross-industry experience is diverse and they created processes to manage each step of the ISIS integration. To begin the discovery phase, a two-day workshop with the pilot business – Australian Turntable Company (ATC) – was conducted to establish requirements, goals, and set expectations. As a company, cross-industry relationships have enabled Media Saints to

develop tools (such as Intranets and other development platforms similar to Basecamp) and specific personnel skills to manage projects (e.g. Account Manager, Project Manager, Producer). Relationship linkages at Media Saints are integrated with sales, strategy and delivery processes, an aspect of operations that the company regards as pioneering. Organisationally, Media Saints are structured to assign skills and processes to promote strong relationships with clients, who they view as partners. In particular, they emphasise a culture of passion and having fun to form comfortable relationships, even where organisational cultures may significantly differ. ISIS is very similar to Media Saints in terms of their approach to problem-solving, communication, and tools, but during the discovery phase ISIS mentor Simon Curry (Galbraith and Co.) proved to be of high value, overseeing the project 'flow' and arbitrating issues that typically would not have been addressed.

Media Saints' view of innovation is consistent with their interactive media industry and business approach. Most business tools, solutions, personnel and services are planned with a view to generating unique IP that has a feasible growth path and business strategy. Their ability to innovate is challenged by lack of cash-flow with which to resource ideas, in particular, managing quick-failure and matching creative ideas with viable sales/business strategy and models. An open approach involving external industry individuals and user-feedback has formed a successful model (such as the social media website 'Conquering California'). Skills, resources and capital comes through the leadership of the Managing Director and creativity of the Creative Director, a model typical of creative interactive media businesses, resourced appropriately for the ISIS project. Together they both drive a culture of intrapreneurialism (Lindgaard & Kawasaki, 2010).

The discovery phase revealed a perceivable skills gap with the ISIS pilot business, ATC: although the outcomes of the ISIS project were viable, the IM team anticipated that the internal processes and systems of ATC may need to develop digitally to fully streamline

their business at the acceleration stages. ATC themselves recognised this and expected to hire more talent to fill skills gaps as the franchising business developed.

Media Saints were matched with Australian Turntable Company (ATC). ATC is an independently-owned family business that began manufacturing large turntables for exhibition events, and now produces turntables for numerous applications and sectors around the world. This includes architectural engineering, mining and to a lesser degree, construction companies. The company is based outside Melbourne in the rural area of Bendigo and employs around 15 people full-time. ATC specialise in rotational movement – better leverage, creating, and saving space – through innovative design and manufacturing methods such as laser-cutting technology. As a family company, ATC values relationships as deeply important and through ISIS, were looking for a clear and reliable relationship network to understand and share their risk. In their business, which relies on innovation to provide value, it is critical to build and maintain 'rigorous relationships' in order to find the detail necessary for their products' success.

The aim of the ISIS Victoria pilot integration for ATC was to increase market growth by gaining a wider audience, as well as to use online technologies as distribution networks for their products to gain entry to new vertical markets. Without ISIS, ATC would have pursued digital marketing, due to a general lack of knowledge surrounding interactive media. Upon reflection and through ISIS observations, ATC believes digital marketing would probably not have succeeded. With ISIS as the intermediary, ATC felt confident moving into a successful cross-industry collaboration with Media Saints. Prior to ISIS, ATC's cross-industry experience had been limited to engineers, architects, and some town planners via development applications, where interactions centred on raising awareness of product specifications and capabilities. ATC have to understand their partners' processes in order to achieve a mutually agreeable outcome. Commercial agreements usually facilitate the information exchange, dealing with subjects

such as IP, confidentiality agreements, (global) installation and, in particular, warranty. A key obstacle for Media Saints was that ATC, by their admission, lacked any specific interactive media (IM) experience internally, or any previous external engagement in the area. Although ATC were willing to engage cross-sector, IM projects, including ISIS, were far from their comfort zone. Through the ISIS discovery phase, developing new ways of engaging with the creative process was a positive experience, and ATC formed a strong partnership with the IM team – who were similar in size, development path and aspirations. Mentoring, in particular, provided a great mediation channel to overcome any differences between the industries (rather than organisational structures), where lack of process knowledge may have led to negative perceptions and conflict. ISIS and the mentors removed conflict before it happened, managing expectations to jointly achieve the best possible end result.

ATC regards itself as highly innovative in its sector, encouraging a strong culture of improvement, asking employees to come up with solutions as well as problems. Part of this culture stems from their early development days in exhibition events (where they were eventually copied by competitors, forcing ATC to think more innovatively). As none of the ATC family employees are formally trained engineers, internal R & D has created an inherent culture of innovation, with the principle focus on turntable technologies, together with additional user-input/feedback from customers, users (such as installers, welders, etc.) and manufacturers (including suppliers). Additional capital funding would assist the ability to explore further R & D, including leveraging additional (shelved) IP. The firm promotes innovation, supported by sub-groups that are resourced ad-hoc to conduct R & D. Entrepreneurialism and innovation are inherent to the company as they are small, guided by Paul (Executive Chairman and family father), who founded the company and initiated the opportunity with ISIS. The rest of the family/business leans towards operational and internally-focused entrepreneurialism, or intrapreneurialism (Lindgaard & Kawasaki, 2010).

Incubation phase

According to Media Saints, the success of ISIS lies in maintaining a long-term relationship with ATC, and ‘white labelling’⁷ the platform software. They also hope to expand into projects of similar nature in future by leveraging the ISIS platform IP in other manufacturing and distribution networks, as well as expand into the government sector with initiatives like ISIS.

For Media Saints, the ISIS project brought about structural change, as the business diversified into separate consultancy and IP ownership arms. For Media Saints, validation of the ATC/ISIS platform was an opportunity to ‘white label’ into other industry groups and stimulated their desire to develop and own IP and build consulting services, which also enable the cross-selling of rich media assets. Media Saints see the online platform as an enabler for companies like ATC that need self-replicating communications networks for distribution.

Simple and self-learning, the platform is modelled on the Software as a Service (SaaS) approach to licensing, (whereby services may simply be activated/deactivated, rather than deleted, according to customer needs). Employing simple distribution as well as being user-friendly, the white labelled platform also provides valuable data metrics. Beyond ISIS, Media Saints aim to start a company with joint ownership of IP, split 50/50 with ATC. Through the joint sessions with ISIS, both parties share the same ambition for the ISIS project.

A possible threat to the opportunity of the joint venture is of course a larger competitor with more resources creating a similar product. An additional threat is posed by potential customers dismissing this approach due to the failure of existing systems. It is hoped that through the simplicity of the product design and audience training to demonstrate the user-friendly qualities of the platform, ATC can address this particular threat.

Media Saints have also connected through both ISIS and the Ai Group with one of the ISIS non-runner pilot businesses, Bendix (part of the comparison group study in this evaluation). Bendix initially proposed the creation of their own platform for training suppliers and distributors – ‘CarSmart’ – for the Victoria Pilot Integration. As part of a significant selection process of nine other competitors’ suppliers, Bendix selected Media Saints and the ISIS platform. For Media Saints, the platform created through ISIS brought these connections and relationships together, with the advantage of creating spin-off work.

As a result of the discovery phase of the ISIS project, ATC underwent significant change. For the incubation stage – validation and product prototyping – ATC decided (through consultation and agreement with ISIS) to focus on developing a distribution model that responded to the challenges of operating on a global scale. ATC have struggled with the logistics of getting people ‘on the ground’ quickly to maintain ATC products (for warranty and maintenance), and ATC’s goal was that the platform prototype created with ISIS would move their business towards a service provider model, assisting distributors with supervision and installation, freeing ATC to focus more on design and engineering value by outsourcing sales, servicing and maintenance of products to a global network of distributors via the (ISIS) platform. The increasing cost of manufacturing in Australia is a major factor driving this change, and ISIS assisted ATC to act more quickly to develop their new model. Eventually, ATC hopes also to focus on outsourcing less specialised elements of manufacturing, as well as sales, servicing, and maintenance. The vision for the platform includes a back-end framework that will allow ATC to select and attract distributors, assess security, due diligence, and manage month-to-month dealings. The platform will integrate Customer Relationship Management (CRM) information and Enterprise Resource Planning (ERP) systems. Other systems that may be integrated include identity management,

⁷The term ‘white label’ is often used for products or services that can be easily redesigned for or rebranded for use by another company or organisation. This has been particularly successful in software development whereby a companies use white label products or services to avoid the costs of creating new technology or infrastructure.

technical management, and project management components based on existing and/or open-source software. Together these systems combine to form the overall 'platform'.

Through ISIS, this new approach and business model is helping ATC simplify their processes, compartmentalise distributor access to information, and increase brand awareness. In the short term, ATC's goal in the acceleration phase will be to focus on outsourcing sales through the portal, and they are already embarking on trials with distributors and negotiating Memorandums of Understanding (MOUs). In the medium term, by redeploying resources to concentrate on product management and manufacturing innovation, ATC hopes to break into new sectors with higher margins such as mining, defence, and outdoor installations. In the long term, ATC will be looking for investors and to invest in specialist machinery to develop these innovations.

To maximise the success of this model, ATC needs to provide some form of IP protection, important to distributors. For example, ATC holds no patents in the 'standard' product range. This is important because sales are much higher in this area than in their specialist product range, where ATC do own patents. The risks to this model succeeding are the huge costs associated with patenting components, including selecting which countries to register. As well as the risk of non-patenting, there can also be too much focus on patents, and in practice patents are only useful if they can be defended, so extensive legal wrangling and litigation expenses are also a known risk. ATC hopes to mitigate these risks by maintaining their status as product leaders in innovation, and harnessing distributor/customer relationships created via the ISIS platform.

The health of the ISIS project throughout all stages was very good: risks and disruptions to the overall project have been minimal, or overcome. Both project leads from ATC and Media Saints travelled to Santiago for a partner Expo run by the Australian Trade Commission (ATC) with the intention of introducing and

leveraging further cross-industry relationships. Together they pitched a video presenting the benefits of the platform they were developing with ISIS to attractive South American mining clients. While a viable venture, this meant that without key stakeholders to manage the ISIS deliverables the project experienced minor slippages.

Through ISIS, ATC have also been provided with additional links (outside of their sector) to the mining industry through GBI Mining. GBI have extended an offer of providing benchmarking services to ATC, affording ATC an additional (and unique) product data-set, with the goal of turntable products being integrated into mining practices. Both ATC and Media Saints hope to develop and continue to grow their relationship beyond ISIS. ATC and Media Saints are already engaging with local councils to identify 4–5 other companies for the next phase of group testing. Following this phase, both parties plan to form a separate entity (a new company as a joint venture) to further develop the ATC network of franchisee distributors, as well as exploit the benefits of the overall platform white label approach, just as Media Saints achieved with Bendix.

Target and comparison group evaluation

Each ISIS pilot integration defined a specific problem with a solution that met ISIS milestones and delivered a viable prototype or proof-of-concept that was testable. The next step in each pilot integration will be to use the results of the user-group testing to refine or further develop the ISIS outcome into a complete commercial online interactive media solution for each of the host/pilot business sectors. The precise development and commercialisation paths that will lead to success are currently unknown and are outside the remit of ISIS. However, the relationships within pilot integration teams look likely to be maintained and developed further over the next 6 to 18 months in some extended commercial form. Each interactive media (IM) team has

also extended or enhanced the longevity of its business models, not only through the ISIS pilot integration, but also through the strengthening of business development processes and exposure to new business opportunities. All of the pilot businesses have accessed interactive media skills, knowledge and expertise that was lacking within their businesses. Although ISIS helped to provide funding, all pilot businesses (including comparison businesses) viewed ISIS as reducing or limiting risks, and reducing the types of cultural mismatches experienced in previous cross-industry experiences. Pilot businesses have all become predominantly product focused, with definitive problem/solution specifications which were not apparent from the outset of ISIS. This differs slightly from the IM teams, who had fee-for-service driven models they wanted to further develop through ISIS, in addition to their secondary product and IP aspirations.

ISIS Pilot Businesses (PB)												Non-ISIS Comparison Businesses											
GBI (QLD)				ATC (VIC)				UNE/SIMERR (NSW)				QLD Museum (QLD)				Bendix (VIC)				Ambitious Software (NSW)			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
5	5	5	4	5	5	4	4	4	5	4	5	1	4	1	2	1	4	1	3	1	3	2	1
Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8
5	3	5	5	5	3	5	2	5	2	4	4	4	2	4	5	5	3	2	5	1	2	5	2
SCORE: 37/40				SCORE: 33/40				SCORE: 33/40				SCORE: 23/40				SCORE: 24/40				SCORE: 17/40			

Table 3 - Outcomes for pilot vs comparison businesses

ISIS Interactive Media Businesses (IM)												Non-ISIS Comparison IM Businesses											
ZONE4 (QLD)				MediaSaints (VIC)				Toggle Media (NSW)				Josephmark (QLD)				Current Circus (VIC)				Ark Games * (NSW)			
Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
5	5	5	5	5	5	4	5	4	5	4	4	1	2	1	1	5	5	5	5	3	4	1	5
Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8	Q5	Q6	Q7	Q8
5	3	3	4	5	4	3	4	4	4	4	4	2	5	5	5	4	4	2	5	1	1	5	1
SCORE: 35/40				SCORE: 35/40				SCORE: 33/40				SCORE: 22/40				SCORE: 35/40				SCORE: 21/40			

Table 4 - Outcomes for interactive media vs comparison businesses

- Q1) Has the project reached proof of concept stage?
- Q2) Has the project developed a business case?
- Q3) Has the project developed IP?
- Q4) Has the project found new customers?
- Q5) Has the project found new partners?
- Q6) Has the company grown?
- Q7) Has the company changed in significant ways?
- Q8) Has the company engaged business mentors/consultants?

- 5 = Definitely true
- 4 = Somewhat true
- 3 = Maybe/unsure
- 2 = Somewhat not true
- 1 = Definitely not true

*Ambitious Software were potentially both PB and IM for NSW, however as IM team dropped out of ISIS interviews were undertaken at the pre/post phases with Ark Games so also provide comparative data.

Pilot Business (PB)	Comparison Businesses
GBI (QLD)	QLD Museum (QLD)
<ol style="list-style-type: none"> Poor ability to engage IM and deliver successful outcome (solved) Inability to grow services model and open new international markets in the mining sector (licensing model in place) Lack of take up of services and value take-up due to inaccessibility of paper-based reports (solved) 	<ol style="list-style-type: none"> Poor access to internal IM resources and external funding to engage IM teams (not solved) Greater reach of physical exhibits and objects (being addressed – QMX) Improve education of cultural and national heritage to new virtual audiences (being addressed – QMX)
ATC (VIC)	Bendix (VIC)
<ol style="list-style-type: none"> Poor understanding of IM capabilities (solved) Ceiling on growth due to inadequate international market reach (model in place) Operational & sales overheads distracting core manufacturing innovations (part solved) 	<ol style="list-style-type: none"> Poor access to internal (and external through corporate network) of IM resources (not solved) Greater awareness of products through online training (process is beginning) Limited CAPEX budget on full-blown program of work (not solved – now three stages)
UNE/SIMERR (NSW)	Ambitious Software (NSW)
<ol style="list-style-type: none"> Limited internal resources and expertise to engage IM team (not solved but more confident) Offline product limited to use in children in schools (part solved) Inability to realised potential of IM for social improvement (solved) 	<ol style="list-style-type: none"> Limited availability of philanthropic funding to develop game (not solved) Provide a way to donate to a charity through social media gaming (not solved) Gain exposure to larger commercial companies to grow (not solved)
ISIS Interactive Media Businesses (IM)	Non-ISIS Comparison IM Businesses
Zone4 (QLD)	Josephmark (QLD)
<ol style="list-style-type: none"> Inability to develop business model beyond fee-for-service (part solved) R&D into new areas of visualisation and data innovation (in progress) Define and enhance USP by generate unique and high value-IP (solved) 	<ol style="list-style-type: none"> Define a clear identity and USP for the whole business (in progress) Limited availability of key partners to oversee full project lifecycle (not solved) Business sustainability and growth through project management (in progress)
MediaSaints (VIC)	Current Circus (VIC)
<ol style="list-style-type: none"> Inability to enhance full creative potential and innovation through commercial projects (part solved) Develop opportunity for business model to grow through both services and IP ownership (model in place) Cultivate relationships beyond current customer base into new sectors (model in place) 	<ol style="list-style-type: none"> Lack of financial stability to sustain focus (model in place) Develop stronger commercial ties and brand awareness (model in place) Enable services to therapists, physios and health carers for game-play rehabilitation (active)
Toggle Media (NSW)	Ark Games * (NSW)
<ol style="list-style-type: none"> Develop a sustainable business around face-to-face training materials for education and non-for-profit (model in place) Build a sustainable client base though case-studies and long term relationships (model in place) Inability to develop techniques and understand mechanics to innovate in the learning environment (model in place) 	<ol style="list-style-type: none"> Apply IM gaming with neuro-science research (not solved) Limited opportunity to create own products and entertainment games (not solved) Gain deeper exposure and business sense working with other sectors (not solved)

Table 5 - Business problems and solutions of pilot vs comparison businesses

The Queensland integration seems to have the most mature outcome, predominantly due to GBI Mining having a more clearly defined problem and solution. Although their data analysis services offering was mainly bespoke, the methods, techniques and data sources were reasonably well-developed. GBI recognised the opportunity to transform services into products using interactive media, which would also help to meet the requirements of its customers. GBI had previously attempted a similar project (Jellyfish⁸), which failed, although the company gained significant insights from that experience. Also, GBI's strong IT skills, combined with its database content, meant that its data integrated readily into the backend of the ISIS product, and this improved the ability to be specific about the final outcomes and goals of the project. Unlike the New South Wales (NSW) and Victoria integrations, GBI chose to use the discovery phases of ISIS to focus on IP/legal elements and the creation of the joint venture between Zone4 and GBI.

For the NSW and Victoria integrations, the problem/solution process during the discovery phase was also varied. For NSW, although the problem to move QuickSmart online was clearly defined, the language and expertise required to articulate a solution was less clear. The change in UNE's objectives, the addition of new funding stakeholders, and the exit of initial IM partner Ark Games, meant that UNE and Toggle had to meet several challenges to achieve their final outcome, including the fact that the Toggle team were working together for the first time as a business. For the Victoria integration, problem definition was less clear: focusing on ATC's need to change its ways of working and embrace interactive media. Media Saints very quickly established a strong working relationship with ATC to define the problem/solution and validate the approach, which required that ATC undertake a significant business-model change.

The comparison group's business models are more varied than the models of the selected ISIS businesses. In the comparison businesses in Queensland (Queensland Museum) and Victoria (Bendix), the ability to innovate through interactive media was seen as a matter of business structure, rather than culture or skills. The comparison groups sought alternative funding sources. Queensland Museum is reorganising its structure, creating QMX (Queensland Museum eXperience), dedicated to broadening delivery of the museum experience nationally and internationally through interactive media. Bendix, an automotive brake-pad manufacturer, is part of a larger global group totalling more than 450 employees. The company's objectives (proposed to ISIS) were to increase market awareness of its products. It has since pursued possible solutions through internal vertical supplier opportunities, and eventually selected Media Saints as the IM vendor.

Outcomes for the comparison IM teams varied. The NSW comparison business, a media and philanthropy gaming company called Ambitious Software, was a candidate as both IM team and pilot business. Neither Ambitious Software (nor initial participant ARK Media), have developed as businesses. In contrast to these IM teams, the Queensland comparison IM team, Josephmark, has more than doubled in size since the initial ISIS application because of its engagement with a global social media brand (Myspace). Josephmark has engaged with consultants who work to improve external business process reengineering in an effort to help the company define and optimise its business for more sustainable growth. Similarly, the IM comparison group for Victoria, Current Circus, has developed momentum alongside its health offering with growth in interactive music composition arm to enhance its financial stability.

⁸It is worth noting that some of the Project Jellyfish work could be leveraged and reused due to the final ISIS outcome, a possibility that GBI Mining had not expected.

Summary of outcomes for the pilot businesses

In the Queensland pilot integration, the vision was very specific: to convert GBI’s data services into ‘products’ through the visualisation enhancement provided by Zone4. A demonstration prototype has been developed, ready for GBI to show at a major mining exhibition being held in Las Vegas this year. The prototype addresses the need to bring to life the enormous amount of data contained in textual reports, in a format that GBI’s customers can understand and interrogate. The advantage for the customer is the ability to capitalise on the operational efficiencies of GBI’s feasibility studies through appropriate visual presentation. Previously, such data was buried in paper-based reports. Customers will also be able to identify operational inefficiencies highlighted through the visualised data – inefficiencies that could save the mining industry millions of dollars. The potential of this approach for competitive advantage has led GBI and Zone4 to form a joint venture partnership to license

the final data visualisation platform as a ‘white labelled’ product. The interview with the business mentor suggested that there were two important obstacles that ISIS helped overcome. The first was persuading those in the mining industry that interactive media and gaming methods could be used outside entertainment both accessibly and inexpensively. ISIS also helped demonstrated the effectiveness of joint venture collaborations to an industry where fee-for-service is the norm.

More than a prototype or proof-of-concept, the outcome of the Queensland pilot integration is close to a working product. This is because both teams collaborated openly, and as a result, reached a solution quickly. The original goal was to launch for MINExpo in Las Vegas, but already this has been extended into a full US road show. GBI will maintain traction by signing up existing customers in the US, as well as marketing to build product awareness in the new target markets. Diagram 2 below is an outline of the proposed partnership IP model between GBI and Zone4 that resulted through ISIS.

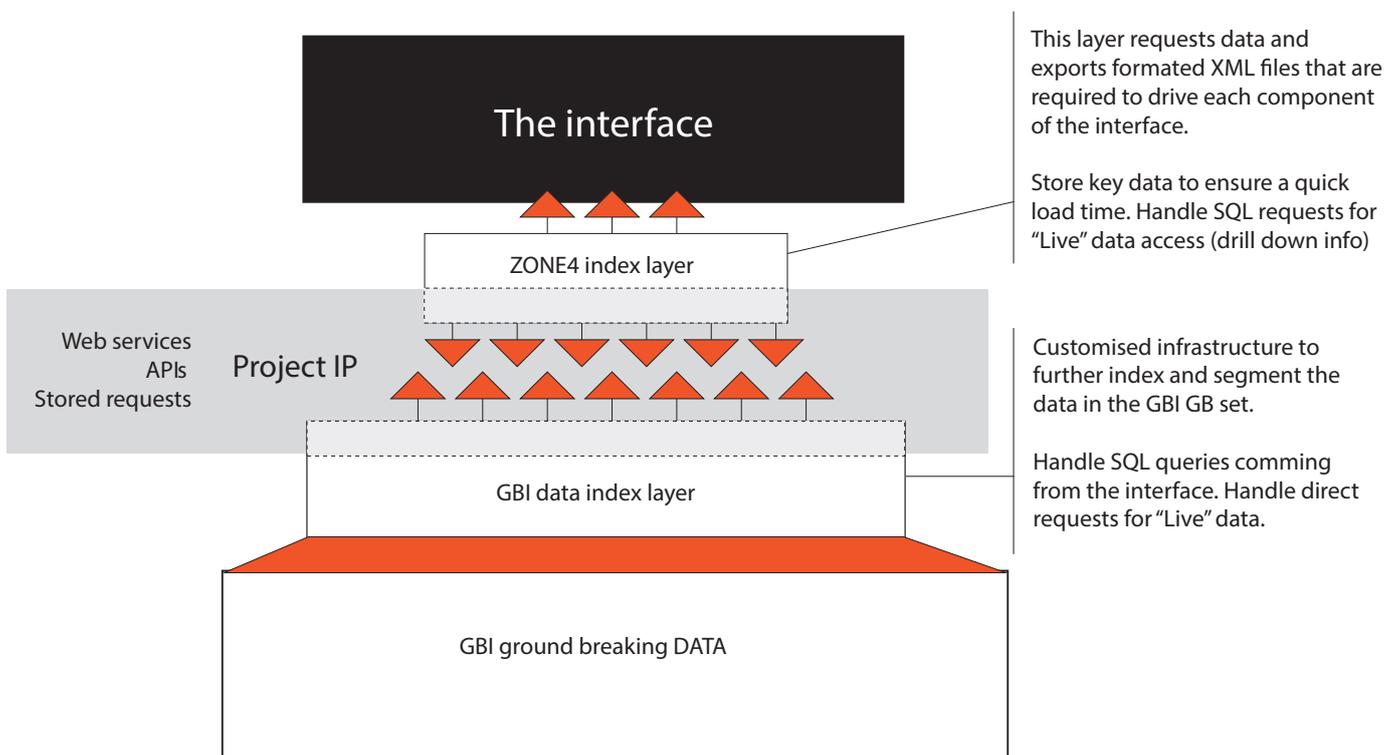


Diagram 2: Proposed IP model resulted from ISIS Queensland pilot integration

The project's main challenges were maintaining collaboration following the difficult joint venture legal agreements and, for Zone4, understanding unfamiliar data-sets. GBI may have underestimated how much ISIS could change its business model, and as a result, the time required to achieve the project goals was affected. The business mentor and an external consultant all played a neutral role in supporting GBI through this transition, while ISIS provided a platform for the goals and visions of both teams to be realised.

Both the NSW and Victoria pilot integrations were initially less advanced in defining the final deliverable outcome, and therefore, were engaged in concept building during the discovery stages. For NSW, the discovery phases required a round of specification and requirements documentation, as well as visual concepts. Although the vision of extending QuickSmart to a wider online audience existed, the company was unsure how to get there. As a result of working with Toggle and ISIS, QuickSmart has achieved these goals, not only by extending its audience from children to adults, but also by extending delivery beyond keyboard-operated computers to touch-screen devices. This broadening of audiences and digital platforms also benefits the wider research of the UNE team, in that it allows user data in all forms to be fed back to help the ongoing product improvement and new research in the neuroscience field.

Expert analysis by the business mentor holds that despite the success, UNE, in particular, were unsure of the necessary steps to achieve their goal, and ISIS brought focus to the process. ISIS encouraged a shared language that enabled collaboration between the relevant parties, which was an enduring benefit. This has been validated by the achievement of a testable proof-of-concept, an essential component that precedes a wider minimal viable-product specification of the broader QuickSmart programme. The steps taken through ISIS have helped to test the broader assumptions of taking QuickSmart online to a national audience. The relationship between Toggle and UNE will continue to develop additional components.

ISIS has helped to kick-start Toggle Media's business and key insights have been forged around the establishment of its internal processes and commercially informed business strategies. ISIS has provided Toggle with much more confidence in winning new business, and provided UNE/SiMERR with more knowledge of the possibilities of interactive media technology to achieve greater reach of their project and feedback into their research. It is hoped that as a small research group with large aspirations, SiMERR's appreciation of how to engage with a SME, will filter through to the wider educational institution of UNE.

The Victoria pilot integration's goals were less defined. Both the pilot business and the IM team had specific business model goals they were hoping to achieve through ISIS. ATC wanted to simplify its processes, compartmentalise access to information and increase brand awareness through interactive media. Media Saints wanted to separate its business into two arms: services and consulting. Both companies identified the benefits that ISIS brought through funding, as well as being matched with a similar sized organisation with similar values and outlook. In the initial part of the discovery phase, both companies immediately held a series of workshops to identify problems that the ISIS outcome could solve. Very quickly, a valid problem/solution was identified that could be developed into a white label product and could be reused by both companies: ATC could use the product to manage and outsource/franchise part of its distribution network, and Media Saints could further develop the product into more distribution channels and sectors.

Using a series of customisable, open-source software solutions, the platform would integrate with other systems (such as ATC internal systems), allowing suppliers and sales teams globally to create profiles and access financial and work tasks. ATC could also use the platform to compare its supply chain and overall brand quality. This would free ATC (or other businesses) from management and operational overheads and would enable them to focus on their core strength, which is manufacturing

production and innovation. Such companies could then develop a greater product reach within a global market, allowing a focus on new sectors (such as mining) and the opportunity to compete globally.

Expert analysis by the Victoria business mentor suggests that the pragmatic way the discovery process unfolded helped to develop a brief that was driven by the business model rather than technology. ISIS provided early-stage seed funding, which enabled the first-stage release of a prototype that is a usable and viable product. Both companies identified the ISIS product as a new revenue stream through which they could leverage their expertise. This was not considered prior to ISIS. The pilot business and IM teams believe they have established a good long-term relationship and are aiming to develop additional rounds of funding over the next three to four years. The next steps to gain traction in the marketplace will involve investigating ways to resell to distributors and developing the discipline to focus on sales. Both teams have been well balanced and their members have encountered new fields of expertise and business. Together, they have developed a platform for the business application sector that is flexible and not onerous. The challenge now is how ATC, as the pilot business, takes advantage of the opportunity and maintains its position as an innovation leader in the digital economy.

All pilot businesses declared at the beginning of ISIS that their staff lacked interactive skills, knowledge and expertise. Hence, they were seeking the opportunity to engage those skills through external partnerships supported through ISIS funding. In all cases, the pilot businesses stated that even with a clear vision, they would not have known how to engage with the right team with the right skills as they did with ISIS. In the past, these businesses have not been able to engage in cross-industry projects with the confidence that they could mitigate the associated risks. ISIS also demystified interactive media technology for those businesses. Innovation is recognising potential and expanding people's ability to interact with the necessary agents and

information. ISIS empowered these small firms to engage in research and development through independent third parties that facilitated the activities.

A clear, valuable outcome of ISIS is the new IP generation and ownership knowledge gained by participants. Although the model of IP ownership in each ISIS integration varies, all support the longevity of business models and encourage dual responsibility by both parties. Typically, a fee-for-service arrangement would place IP and business models in the hands of the host company (that is, the organisation that commissions the service), with the service provider either licensing or relinquishing IP as soon as the project ends. ISIS has proved that when there is a material opportunity for the IM team to generate new and unique IP, the partners flourish. In the Queensland integration, both parties are developing IP under a separate joint venture entity (75/25 split in favour of the pilot business). This is an indicator that through structured and seed-funded research and development, an SME has the ability to commercialise its innovations (Teece, 1986; West, 2006). Commercial validation of the GBI data platform is yet to happen, however, indicators from all parties, including the expert analysis of business mentors, suggests that all outcomes have been substantiated as commercially viable. Of course, the commercial success of each product will only be proven once each product is tested in the marketplace.

Evaluation of internships

The evaluation team interviewed four interns who had been placed with target IM companies as part of the ISIS scheme. The interviews were used to gain insights into the intern experience in terms of internship set-up and management processes, and the perceived value of the internships for skill development and employability.

Description of the internships

Participants 1 and 2 (P1 and P2) spent two months with SME Media Saints (digital services) in Victoria. During this time, they primarily worked on designing and developing a portal website for teachers and students for a game the company had co-developed with an educational publisher. P1 was in the final year of undergraduate study at the time of the internship; P2 had already graduated from an undergraduate program. After their internships ended, both interns were employed by Media Saints to finish the ISIS pilot integration platform development.

Participant 3 (P3) spent one semester with the micro-business Toggle Media (education/gaming) in New South Wales. During this time, P3 was engaged primarily with paper and digital prototyping and testing user-interface flows for an educational game. P3 was in the final year of undergraduate study at the time of the internship.

Participant 4 (P4), an international student, had completed one-third of a one-semester internship with micro-business Zone4 (visualisation) in Queensland. P4 was part-way through a project related to user-interface design for mining data analytics reporting via multiple devices. P4 was in the final semester of a coursework master's program at the time of the internship.

Internship processes: Set-up, management and relationships

All four participants found out about the internship opportunity through personal

communication from a lecturer. In each case, the lecturer recommended that the student apply. The application process involved the submission of a portfolio and CV, followed by an interview with the IM company. Justin Brow of the ISIS team facilitated much of the communication between the students, their universities and the IM companies.

For P1, P2, and P3, tasks to be completed during the internship were negotiated after commencement. Interns were given a list of possible projects and asked to indicate which they would like to work on. For P4, a specific project was outlined in the internship position description. This intern wished to undertake a project involving user-experience design across multiple devices, and had already contacted a number of companies in search of a suitable internship. The exact nature and scope of P4's internship was negotiated between the student and the IM company prior to commencement.

All participants reported that they found their manager and team at the IM company to be approachable, friendly and supportive ('I was really encouraged to ask questions' (P1); 'They're just a lovely company. I had a great time' (P3)). All participants were very satisfied with the efforts the IM company had made to include them and ensure that they felt 'part of the team' (P1).

Participants reported that the process of internship set-up was fairly informal. This informality was viewed largely as 'not a problem' (P2) and sometimes an advantage in terms of the flexibility of the experience and meeting individual needs.

P1 reported that they would have liked to receive university credit for the internship experience, but that they had 'fallen through the cracks' as far as the university was concerned. P1 said that there seemed to be 'minimal institutional support' at their university for the ISIS internship scheme (although individual university staff members were very supportive). P3 and P4 did receive credit for their internships within their respective universities.

None of the interns had an immediate sense of the special relationships between the host companies and target companies and other inter-organisational and inter-sectoral relationships that had been established for the ISIS project. All of the interns were engaged in core IM tasks. P1 and P2 did not work with the host company at all (ATC); rather, they liaised with an 'educational publishing client'. P3 talked about the education/games market niche that the IM company occupied and the fact that the manager of the IM company needed both education-pedagogy and games development skills in order to work effectively with the 'client company' (QuickSmart/UNE). P4 did not mention the host company (GBI Mining) during the interview.

Each of the host IM companies reported being impressed with the ISIS interns and could exemplify positive experiences with P1, P2 and P3 interns. (P4 intern had yet to be embedded at the time of IM interviews). P1, P2 and P3 participants were all introduced to the pilot integration projects either after or during the discovery stages of the project. Each IM stated this can be problematic when briefing participants so they can be fully informed with project tasks and goals. Nevertheless, Media Saints noted they were impressed with how P1 and P2 hit the ground running with project deliverables, adding value together, and quickly integrating within the overall team. The discovery stage for Toggle Media was more intense, due to complex challenges surrounding changing project scope and deliverables of the pilot integration, which meant they were unsure what skills they needed from interns and in what timeframe they needed them. As with Media Saints, once the prototyping stages were underway, Toggle provided hands-on training to P3 and responded that overall, their participant had contributed significant assistance with the final prototype. Both IM teams recommended better alignment of timelines with engagement of participants however, they also recognised some limitations of academic timetabling (e.g. holidays, curriculum commitments). Media Saints in particular noted that they have been involved previously with other student interns who were unreliable, but noted they were

encouraged by the levels of accountability shown by the ISIS interns (P1 & P2).

Intern expectations and realities of the job

Three of the four interns worked on projects that differed significantly from their expectations. P1, P2, and P3 all expected to work on various technical aspects of game development during their internships, but ended up working on interactive and visual design projects ('website design' (P1 and P2); 'prototyping, graphic design, integrating user interfaces' (P3)). All three expressed disappointment at not being able to work more on games (all three wish to pursue careers in games development).

However, the interns also recognised that their initial expectations, borne out of industry inexperience, had not been entirely realistic. P1 and P2 indicated that while their IM companies had been working on a game during their internships, the stage of development of the game ('fixing bugs' (P1)) was such that they could not have contributed much to that project. P2 reflected that the bundling of multimedia services (e.g., website design, animation, games, 3D modelling), a common approach in the IM industry, provided some evidence of the need for diverse skills sets in prospective IM employees. P3 recognised that in an IM micro-business, each employee would need to be conversant with many different facets of the business and its services.

P4, a postgraduate student with prior experience in the industry, approached the internship very differently from P1, P2, and P3. P4 wished to undertake a specific project involving the development and consolidation of specialised technical capabilities in an authentic industry environment, and negotiated the tasks they would undertake prior to commencement of the internship. As such, P4 did not report significant incongruence between initial expectations of the internship and actual experience.

Skill development: IM specialist technical skills

P1, P2, and P3 reported relatively little specialist technical skill development during their internships. P3 said that they 'already had the technical skills', and that the assigned task was 'straightforward'; likewise, P1 and P2 said that they 'already knew how to' (P1) design and develop websites of the type required, but that the experience made them more confident that their skills were of a professional standard.

The participants listed a variety of specialist technical skills related to games design and programming that they wished to develop, including advanced 3D modelling and animation techniques. P1 and P2 reported that many of the newer and more advanced games development techniques were not covered in their university courses, either because the skills were too specialised, or because the university had trouble keeping up with the latest developments in IM. P1 said that the university expected students to acquire specialist and advanced skills themselves. P1 approached an animator at the IM company at which they were an intern and received informal animation mentoring. P1 has subsequently arranged another internship at the same IM company to complete a self-initiated project involving game coding and 3D animation.

Skill development: Transferable skills

Intern skill development was achieved largely by applying previously acquired skills in authentic industry situations. P1, P2, and P3 all reported that they had been treated as professionals and were given a significant degree of autonomy with their projects. They spoke about the need to apply and further develop skills in managing projects and their own work – 'showing initiative' (P2), 'making our own decisions' (P1), 'manag(ing) time to make deadlines' (P1) and 'needing to know about budgeting' (P3). The interns were given an initial briefing on their projects and then worked independently. They reported back to their manager regularly, and were able to 'ask as many questions as we wanted' (P1).

P1 discussed the need to be adaptable and resilient, and cited examples from the internship of code not working, having to find a work-around, and needing to redevelop the website when there was a misunderstanding about client requirements. Client management was also an important theme for P2, who said that their most significant learning experience centred on working effectively with clients who did not have a clear sense of their requirements, or had trouble communicating those requirements because of unfamiliarity with IM concepts and terms. P2 was reassured to find out through the internship that client management issues are common, even among highly experienced IM professionals.

Industry awareness emerged as another key area of learning for the interns. P1 reported learning as much from listening to 'war stories' from more experienced colleagues over lunch, where they learned about the opportunities and challenges in the Australian games industry and possible stumbling blocks in games development, such as engine problems and problems in approval processes. For P4, whose previous industry experience was in Singapore, an important objective was to engage in a 'real-world project and experience the culture' (P4) of the IM industry in Australia, including working in a very small company, for an Australian client, and with minimal supervision.

Business and enterprise skills also emerged as an important area of learning for P1 and P2. P1 said: 'I'm not a business student. It's not me. I'm not confident, I wouldn't know how.' However, P1 also recognised that running a small business was part of industry reality and said that they would like it to be part of their future. At the time of the internship, P2 was attempting to start their own IM business and also indicated a lack of confidence in their business skills.

Enhancement of employability

All of the interns believed they were more employable as a result of their internship experiences and also felt more confident about attempting to build a career in the IM industry.

P2 said that it was particularly comforting to know that despite very little industry experience, they were still able to contribute and 'be useful from day one'. P1, P2, and P3 each commented that they believed a games-specific internship would have been more helpful to them in pursuing their chosen career paths, but all agreed that industry experience in an IM company was an asset, both in terms of skill acquisition and being able to demonstrate industry experience to future potential employers.

P1 discussed the important role of social networks in career-building in the IM industry and indicated that they had made excellent contacts through the internship. After their internships finished, both P1 and P2 were contracted by the IM company to do further paid work on the website they were developing.

Contextualising ISIS internship with other tertiary internships

The intern interview findings suggest that the ISIS internships were successful in terms of overall enhancement of intern skills and employability. The value the interns ascribed to (1) learning to apply university-acquired skills in authentic industry situations, (2) learning to work in a professional creative environment, and (3) adding real world experience to a student's CV and professional portfolio, was very high. It is therefore somewhat surprising that comparatively few university programs make industry placements and projects core elements of the curriculum (Dalitz, Toner, & Turpin, 2011; Haukka, 2011), although it may be partly due to apparent graduate oversupply in the sector (i.e. more students seeking internships than can be reasonably accommodated by IM firms); and also the involved and resource-intensive nature of internship set-up and management, both for the university and the IM firm (Boose, 2011).

The findings of the internship interviews also support the notion, reported elsewhere (Dalitz, Toner, & Turpin, 2011; Haukka, 2011), that there may be selective skills mismatches between graduate skills and industry needs.

The interns' technical skills appeared sufficient for the work they were performing, although the tasks and projects they undertook may have been selected to accommodate their skill levels. However, many of their non-technical 'transferable' skills (such as client management, project management and enterprise skills) were not of a standard equivalent to their technical and specialist skills, a result which echoes those of other recent empirical studies into creative industries graduate skills vs employer expectations (Haukka, 2010).

The undergraduate interns lacked industry awareness and know-how (DeFillippi & Arthur, 1996), evidenced by the reported mismatch between student expectations of the experience, and the actuality of the experience. In addition, students lacked knowledge of: the range and types of services offered by IM companies (and therefore the need for professionals to be multi-skilled); the intra- and extra-firm processes involved in bringing an IM project to fruition; and the necessity for, and qualities of, inter-sectoral collaborations. While one might argue that it is the very function of the internship experience to provide this kind of awareness and knowledge, leaving such knowledge acquisition until the final semester of study may mean that students engage in up to three years of university study framing their learning with an unrealistic notion of the IM industry, and this can have deleterious effects on their employability (Bridgstock & Hearn, 2012). For instance, a student may have the opportunity to learn creative entrepreneurship and creative micro business start-up skills at university, but through a lack of understanding of the need for such skills, may choose not to take those subjects, or may engage in only surface learning of the skills. Early exposure to industry contexts during degree courses, bringing industry professionals into the classroom (Ashton, 2009) or even concurrent industry apprenticeship programs (Guile, 2006), may prove useful.

Because of the comparative unwieldiness of formal educational curriculum renovation and delivery processes, these institutions are at a significant disadvantage in providing digital

skills development and digital industry-related knowledge. Post-graduation professional education and industry experiences may be an answer to this. Guile (2009) emphasises the potential importance of specialised intermediary agencies in assisting creative industries labour market entrants to supplement their qualifications through the development of vocational practice and social capital. These intermediary companies act as catalysts to form partnerships between firms, networks, educational institutions and emerging creatives. The partnerships may take the form of targeted and quick turnaround short courses, the negotiation of internships and work placements, and the employment of experienced professionals as mentors. Thus, the intermediary agency creates a bridge between 'tertiary student' and 'industry ready professional'.

Discussion, key findings and recommendations

The task of transforming Australia's economy and society into a successful digital economy is significant, and requires a long-term focus. Both government and industry must devise strategies recognising that this process touches all aspects of our economy and society. Australia is not alone in realising the magnitude of this challenge. As the OECD has noted: ICT policies are now becoming less sector-specific and more a part of the mainstream economic policies that concern the economy and society as a whole [...] OECD countries with long-term strategies for information societies typically emphasise the role of ICTs and the internet as key enablers of wider societal change. (DBCDE, 2009, p. 59)

Interactive media provide the gateway for consumers, companies, and citizens to make the digital transformation referred to above. Not surprisingly, there has been rapid development and uptake of anything that facilitates this interaction (Higgs, 2011). For example:

Mobile internet (2009)

- ◇ Number of subscribers: 380,000
- ◇ Access spending: \$48.4 million
- ◇ Subscribers and access spending more than doubled in 4 years
- ◇ (2005 figures = 150,000 subscribers + \$21 million access spending).

Internet advertising market (2009)

- ◇ Market size: \$1.1 billion
- ◇ Tripled over 4 years (2005 figure = \$378.3 million).

Online content market indicators (2009)

- ◇ Online subscription rental market: \$53.8 million
- ◇ Digital download market: \$4.7 million

- ◇ Online subscriptions 11 times larger over 4 years
- ◇ (2005 figure = \$4.7 million)
- ◇ Digital downloads 6 times larger over just 2 years
- ◇ (2007 figure = \$780,000).

Online and mobile game market (2009)

- ◇ Online game market: \$128.7 million
- ◇ Wireless game market \$145 million
- ◇ Online game market doubled over 4 years (2005 figure = \$62.4 million)
- ◇ Wireless game market tripled in just 2 years (2007 figure = \$51.5 million).

Interactive media a potential enabler of innovation in all industries

These developments are consistent with a number of trends in manufacturing that the Prime Minister's Taskforce on Manufacturing (2012) refers to:

- ◇ Blurred boundaries between manufacturing and service solutions
- ◇ Transition from mass productisation to mass customisation
- ◇ Personalisation of products and services
- ◇ Transformative opportunities in digital manufacturing.

Consistent with these ideas, Hearn and Mandeville (2005) proposed two scenarios in which ICTs improve productivity in different industries. The first is by improving efficiencies and reducing the number of people required. The second is by innovations that expand and multiply revenues through new products or markets or business models. Mudambi (2008) suggests that while R & D activities (including design) produce high value-capturing knowledge assets at the beginning of the value chain, other forms of intellectual property (IP) at the consumption end of the value chain – such as creative copyrights, brands, and sophisticated marketing and distribution systems – are also important. Mudambi also argues that the fundamental feature of knowledge-intensive industries is that they are built on intangible assets, not only through

legally defensible rents (patents, copyrights, and brands), but also through ways of organising these intellectual resources through inimitable organisational structures and inter-organisational relationships.

ISIS pilot projects exemplify the second type of innovation path identified by Hearn and Mandeville (2005) and referred to by Mudambi (2008). That is, the pilot projects were not primarily aimed at production efficiencies bought about by reducing staff through automation. For example, in the case of GBI, interactive media enabled the development of a new service model (via subscription rather than fee-for-service), which expands the market of potential clients that can be serviced by the same team, as well as expanding the possibility of new international markets. In the case of ATC, ISIS enabled the creation of an international network of alliance partners, a case of Mudambi's inimitable inter-organisational relationships. The rich case studies provided by ISIS are thus very relevant to all Australian industries, but particularly SMEs vying to be competitive in the global economy.

These types of ICT deployments have been identified as components of High Performing Workplaces (HPW) in another project funded by the Workplace Innovation Program (see Boedker et al., 2011). According to Boedker et al. (2011, p. 55):

ICT in High Performing Workplaces also supports the organisation's business strategies and organisations that consider themselves to have good alignment between their business and ICT strategies are associated with higher levels of performance. In such instances, ICT can help to improve the quality of services and customer experience by allowing the organisation to analyse the nature of customer and stakeholder relations and by building new types of connectivity between the organisation and its environment.

A key factor in the success of ISIS was the brokering process, which involved a combination of matching, individual facilitation, and mentoring. Browne and Hamouda (2010, p. 6) suggest:

The success factors of Silicon Valley start-ups are stated to include their company founders learning through mentoring. It has been indicated that those firms can raise seven times more funding and have three and a half times more user growth than those without mentors. Furthermore, a balance of technical and business acumen in the firm facilitates those firms to raise thirty per cent more money, have almost three times more user growth, and are almost twenty per cent less likely to scale prematurely than technical or business-heavy founding teams.

Hearn and Rooney (2008) argue that while the source of innovation will be mainly the private sector, there is a role for government in facilitating innovation. The relevance of many Department of Industry, Innovation, Science, Research and Tertiary Education (DIISRTE) schemes, particularly Enterprise Connect, is notable here. Third parties who facilitate innovation are very important. R & D outputs with reproducible qualities can clearly be validated by ISIS-like partner organisations as intermediaries. These intermediaries (such as ISIS) are open innovation facilitators, who can help both side of the market (Ollila & Elmquist, 2011). Lopez and Vanhaverbeke, (2009, p. 2) suggest:

These innovation intermediaries actively connect the supply and demand sides of the market, forging links between firms searching for external ideas (innovation seekers) with communities of highly-qualified solution providers (innovation solvers).

These kinds of creative innovations provide more than a GDP dividend; they also provide an employment dividend because they are primarily about increasing revenue, not increasing efficiencies by automating.

The employment dividend of embedding interactive media in industry sectors

CCI research identified the ‘creative trident’ of employment to describe the fact that core creative occupations represent only one-third of the total employment created by creative innovations (see Higgs, Cunningham, & Pagan, 2007). The trident consists of creative occupations in creative firms, support occupations in those firms and creative occupations in other industries. ISIS takes this idea one step further by pointing to a ‘creative quadrant’ that also includes non-creative occupations in non-creative industries that are the result of creative innovations in all industries. ISIS exemplifies the potential of this type of innovation. Furthermore, the employment dividend of embedded creative

digital innovations in other sectors may be substantial. For example, if Australia’s games industry grows by 10%, this creates 100 new jobs. If, however, creative innovations help Australia’s mining industry to grow by 10%, this creates 27,000 jobs. If, through creative innovations, Australia’s manufacturing industry grows by 10%, this creates approximately 90,000 jobs. It is not only the size of the force that determines an outcome, but more importantly, the size of the lever that the force is applied to. The real question arising from ISIS, therefore, is not only how to grow the games industry, but how to contribute to the growth of employment in all industry sectors.

Research by CCI showed that software and digital specialists were employed across all Australian industries.

Division of employment of embedded creatives	Creative occupation segment’s share of embedded employment					
	Music & Performing Arts	Film, TV & Radio	Advertising & Marketing	Software & Digital Content	Publishing	Design & Visual Arts
A Agriculture, Forestry and Fishing	6%	3%	31%	21%	10%	29%
B Mining	8%	0%	14%	46%	15%	17%
C Manufacturing	2%	2%	16%	23%	3%	53%
D Electricity, Gas and Water Supply	1%	0%	14%	63%	7%	15%
E Construction	6%	1%	7%	9%	2%	74%
F Wholesale Trade	4%	1%	35%	36%	2%	22%
G Retail Trade	8%	3%	18%	21%	3%	47%
H Accommodation, Cafes and Restaurants	49%	14%	17%	3%	5%	11%
I Transport and Storage	4%	2%	28%	46%	5%	15%
J Communication Services	1%	3%	16%	67%	3%	9%
K Finance Services	1%	0%	17%	74%	4%	4%
L Property and Business Services	4%	2%	21%	36%	9%	28%
M Government Administration and Defence	3%	1%	7%	27%	25%	37%
N Education	8%	2%	5%	12%	64%	9%
O Health and Community Services	9%	3%	15%	26%	28%	20%
P Cultural and Recreational Services	47%	15%	10%	9%	5%	15%
Q Personal and Other Services	17%	7%	7%	9%	15%	46%
R Non-Classifiable Economic Units	12%	4%	17%	26%	10%	30%
Z Not Stated	21%	4%	8%	14%	15%	38%
Share of All Division’s Embedded Creatives	7%	3%	16%	30%	15%	29%

Table 6 : Creative occupation segment’s share of embedded employment in Australia

Reproduced from: Higgs, P. L., Cunningham S., & Pagan, J.D. (2007). Australia’s creative economy: Basic evidence on size, growth, income and employment. Brisbane, Qld: ARC Centre of Excellence for Creative Industries & Innovation.

Notably, this category was relatively more important than other creative occupations in mining, though still important in education and manufacturing. More recent research (Higgs & Freebody, 2008) shows that from 2001 to 2006, census figures for software and digital employment did not grow as fast as figures for other types of employment. This further underlines the importance of ISIS, both for interactive media firms (that is, to keep core interactive media jobs growing), but also for other industries in which creative deployment of interactive media can bring about innovation and create jobs.

Skill needs in the creative economy

The ISIS education review was concerned about a potential oversupply of games graduates; however, the number of graduates may in fact be correctly matched to the needs of the broader creative digital sector, given that, as Higgs, Cunningham, and Pagan (2007) suggest, the sector comprises 330,000 employees, with perhaps 150,000 of those in the creative digital occupations. The ISIS education review reports that 75% of educator respondents thought 50% of graduates would find jobs in the interactive media industry.

In light of these statistics, the current education system's biggest deficit is not in the number of students that it trains, but in its lack of explicit recognition of the reality of graduate pathways into other sectors, and its lack of thinking about curricula that might be relevant to employment pathways that involve embedding in other industries, rather than freelancing or working in small firms. Hearn and Bridgstock (forthcoming) describe a number of issues, but the most important for this discussion is that of career identity. Most emerging creatives want to be creative and work in the entertainment industry – working for different industry sectors is a significant identity hurdle.

Graduates must be encouraged, therefore, to engage with broader 'embedded' or 'integrated' employment pathways. It is a significant problem that the idea of working in different industry contexts did not feature prominently

in either the curricula reviewed by the ISIS education report, nor in the experiential reports of the ISIS interns, who were at the cutting edge of embedded employment. Career identity is a possible factor. We know that many students entering games degrees want to become games designers. It is very instructive that the embedded creative career path was not understood by the ISIS interns and is not understood by most interactive media students. More must be done to elevate students' awareness of these 'hidden' opportunities.

The importance of career identity issues resonates with the Prime Minister's Taskforce on Manufacturing (2012, p. 5), which questions "how the good news story about Australian manufacturing success can be presented".

We need it to reach everyone from the young student considering an apprenticeship in manufacturing and his or her parents, to the careers guidance counsellor giving advice to students at the local school, to the entrepreneurs, engineers and scientists in other parts of the global economy considering Australia as a location for pursuing a career or setting up and running a business in manufacturing. They need to know that Australian manufacturing represents a good choice for a rewarding working life with many opportunities for advancement and many opportunities to be part of working for organisations that innovate and compete globally to win international business opportunities.

The fact that few business or legal studies subjects are offered in interactive media courses present equally relevant career identity issues, according to the ISIS education review. The lack of such training was also evident in the interviews of ISIS interns. These broader generic skills would better equip graduates for embedded career pathways.

While our overall view of education for careers in interactive media suggests that there is a broadly healthy match of education system and

graduate careers, we must also comment on what was a motivating issue for ISIS: the voice of the games industry in lamenting the lack of available graduates with the specialised skills required to meet that industry's needs (and the needs of other specialist sub-sectors). The ISIS education report found a vast number of related courses, which together were producing around 4,000 graduates for a games sector that only employs 1,000 people. At least half of the curriculum for most of these courses was focused on digital media skills. We also found that the interactive media companies involved in the student internships rated their interns favourably. And yet, the industry is warning of a skills shortage. The ISIS interns themselves considered that they were not necessarily getting access to the skills they were seeking in the internship, but rather had to rely on informal mentoring. How can we explain this paradox? Previous CCI research (Haukka, 2011) suggests there are several reasons for industry views on this topic, but primarily, the issues are 1) not enough 'work context' exposure in course graduates, 2) the very fast cycle of software platforms, and 3) the desire for 'untrainable' personal characteristics such as exceptional creativity and entrepreneurial capabilities.

We believe the Australian education system is producing competent graduates for the broad base of creative digital opportunities in the labour market, but we acknowledge the need for special intervention in relation to the demand for high-end technical and creative skills by the best creative firms trying to compete globally. The ISIS education report recommends that this would be best achieved if:

- ◇ Course providers collaborate with professional practitioners in the interactive media/gaming industry sector to ensure that students in the courses have opportunities, and are encouraged, to undertake work placements.
- ◇ Course providers review the content of their professional practice subjects and units to ensure that they provide material focused specifically on the interactive media/gaming industry sector and its workforce profile and opportunities.

- ◇ Course providers review the content of material relating to business practice and legal frameworks relevant to business success in this sector.
- ◇ Course providers and industry ensure that their effective engagement and co-operation is a key element of continual improvement in courses and student exposure to, and opportunities for, professional experience.
- ◇ Effective co-operation is in place for course reviews and ongoing improvement between course providers and relevant industry peak bodies, in particular, the games developers' associations.

Key findings and recommendations

Improved career outcomes for graduates
ISIS has identified a number of issues affecting career outcomes for graduates. These are:

- ◇ Oversupply of graduates for the number of jobs in the specialist games industry.
- ◇ Unrecognised opportunities for graduates embedded in different industry sectors.
- ◇ Inadequate preparation of graduates by education providers for careers embedded in other industry sectors.
- ◇ The need for flexibility in career path management.
- ◇ Entrepreneurial opportunities for graduates in starting interactive media services firms specializing in particularly industry niches.

Internships

The intern interview findings suggest that the ISIS internships were successful in terms of overall enhancement of intern skills and employability. The findings suggest that there may be deficits in the specialist and technical IM skills delivered in university programs. This is unsurprising, given the rapid technological development in the sector and the unwieldy nature of university curriculum redevelopment and renovation processes. For advanced undergraduate and postgraduate students, methods of specialist skill development could come in many forms.

It is important to consider the stage of the IM project, as well as the nature and type of project that interns will be working on. Interns would need to be brought in during a project's formative stages to avoid them being 'locked out' of value-adding activities later on. As a result, universities must build more flexibility into the timing and configuration of internship programs to accommodate industry realities. Internships may need to be undertaken in intensive block mode or part-time or across semesters. University internship processes must also accommodate various types of internships, whether they are industry initiated, arranged by the student or involve a third party (as with the ISIS project). Any internship opportunities should be promoted at least a semester in advance to allow time for role negotiations, appropriate involvement of supervisors and university accreditation arrangements. Interns can have strong expectations of what they will undertake and what they will learn during their internships and these expectations need to be managed carefully. It would be easier to do this if industry awareness is embedded into degree programs from early semesters, including an understanding of the diverse career destinations in IM and the advantages conferred by possessing multiple IM skills sets that suit both web and games development. Finally, the interview findings imply that the interns in the ISIS program had little notion of the importance of inter-industry collaboration, let alone the skills needed to deal effectively with collaborators and clients from industries outside IM. In addition, the students did not possess requisite enterprise and business skills.

Recommendations:

- ◇ Students and education providers need to be made aware of opportunities in different industry sectors for interactive media graduates.
- ◇ Professional experience programs (e.g. internships) need to be expanded to include engagements with different industry sectors.
- ◇ Business and entrepreneurship training should be incorporated in interactive media degrees and other courses to enable graduates to capitalise on opportunities in niche sectors.
- ◇ Games and interactive media curricula should be reviewed so that students have some knowledge and experience of inter-industry collaborations before embarking on a capstone internship or project.
- ◇ A government funded competitive mentoring program should be established which links 50 final year students with the best creative talents in Australian IM companies.
- ◇ Evidence based interventions should be funded to further validate ISIS-like approaches to innovation in Australian industry through Australia's ARC Linkage and ARC Industry transformation HUBS and CRC programs.
- ◇ Relevant Australian professional associations should be funded to examine the potential of cross-sector opportunities and educate their membership in relation to this.

We also endorse the follow recommendation from the ISIS Education Report:

- ◇ Course providers review the content of their professional practice subjects and units to ensure that they provide material focused specifically on the interactive media/gaming industry sector and its workforce profile and opportunities.

Better equipped graduates to meet the needs of industry

In general, we conclude that the Australian education system provides a supply of graduates with suitable generic competencies to meet labour market needs of the 'creative digital' sector, in which there are currently 330,000 people employed. However, there is a need for intervention to remedy skill shortages in specific interactive media niches, which are bought about by volatile industry conditions, very rapid software innovation cycles, and the unpredictable but crucial demand for highly creative and entrepreneurial individuals in response to rapid fire project opportunities. Data from our evaluation of internships suggests the informal mentoring in high performing companies may be the best way to learn the required skills

Recommendations:

- ◇ We recommend the establishment of government funded competitive mentoring program which links 50 final year students with the best creative talents in Australian IM companies.

We also endorse the education report recommendations that:

- ◇ Course providers collaborate with professional practitioners in the interactive media/gaming industry sector to ensure that students in the courses have opportunities, and are encouraged, to undertake work placements.
- ◇ Course providers review the content of their Professional Practice subjects and units to ensure that they provide material focused specifically on the interactive media/gaming industry sector and its workforce profile and opportunities.
- ◇ Course providers review the content of material relating to business practice and legal frameworks relevant to business success in this sector.
- ◇ Course providers and industry ensure that their effective engagement and co-operation is a key element of continual improvement in courses and student exposure to, and opportunities for, professional experience.
- ◇ Effective co-operation is in place for course reviews and on-going improvement between course providers and relevant industry peak bodies, in particular, the games developers' associations.

Take up of interactive media services by firms in other sectors

ISIS has identified significant barriers to the uptake of interactive media services by firms in other sectors as well as developed solutions to remedy these problems. Based on the success of the ISIS pilot integration projects; and our review of relevant literature, we believe that there are significant opportunities for the uptake of interactive services in other industry sectors. ISIS experience suggests significant opportunities exist for SMEs. If made widely

available, the tools and approaches developed by ISIS will accelerate the uptake of interactive media services by firms in other sectors.

We agree with the ISIS project report that:

- ◇ The initial assessment and brokering was a key factor to the success of the partnerships. This referral capability could be built into a range of government business programs and awards or tailor-made industry briefings.
- ◇ The intensive facilitation and mentoring inputs provide significant returns on investment in terms of new ventures, products, and market penetration.
- ◇ High-value cross-sector partnership approaches require specific skills in, and knowledge of, the business context and design-led innovation processes by games and IM companies.

Recommendations:

- ◇ Fund Australian interactive media industry associations to examine the potential of cross-sector opportunities and educate their membership in relation to this.
- ◇ Conduct future research examining the potential for the transfer of ISIS methods to SMEs in particular.

We also endorse the ISIS final report recommendations to:

- ◇ Scope existing business support/transformation/funding programs which could be leveraged to support further ISIS integrations.
- ◇ Support potential research linkage grants to continue the ISIS industry and business research.
- ◇ Support potential games and interactive media industry professional/enterprise development strategies to develop integrative capabilities to expand their markets.
- ◇ Support games and interactive media industry professional and enterprise development strategies to develop integrative capabilities – senior management mentoring strategy.

- ◇ Scope the opportunities to leverage existing researcher placement programs, such as Enterprise Connect's Researchers in Business program, to expand the benefits for ISIS cohort firms.

Impact among program participants compared with non-participants

The comparative case study approach has been useful in demonstrating that ISIS was an effective intervention for the pilot businesses and interactive media teams. All three of the pilot integrations are evaluated to have been very successful in achieving the specific aims of the integration and also in contributing to the development of the companies involved. We note that a 100% success rate is rare in interventions of this kind. Outcomes achieved include innovations to proof-of-concept stage, new business models, shared IP arrangements, joint ventures, international marketing engagements, and professional and company development outcomes. The internships were also successfully acquitted with intern outcomes comparable to best practice in Australian tertiary internships.

Recommendations

- ◇ Evidence based interventions be funded to further validate ISIS-like approaches to innovation in Australian industry through Australia's ARC Linkage and ARC Industry transformation HUBS and CRC programs.

We support the ISIS report recommendation to:

- ◇ Scope opportunities for research grants/linkage grants to continue to monitor and report on the ISIS cohort over a longer time frame, and to build further knowledge around integrated innovation.

Use of resources, tools guidelines and learning experiences by project participants

In practice, ISIS is best thought of as developing a set of learning experiences guided by expert facilitators, supported by the ISIS Integration Framework. The Framework provides a distillation of these learning experiences but we believe that the active involvement of skilled personnel as facilitators is an essential part of ISIS. In relation to this, the ISIS participants strongly commended both the Project Director Justin Brow and the mentors Hamish Hawthorne, Sonya Henderson-Edbrooke and Simon Curry.

Recommendations:

We endorse the ISIS final report recommendations to:

- ◇ Promote and disseminate ISIS Integration Framework and case studies.
- ◇ Promote the outcomes of ISIS project.
- ◇ Promote the case studies and value of the ISIS program to high potential company cohorts (such as the export awards applicants or target firms).

References

- Andrews, G., Yeabsley, J., & Higgs, P. L. (2009). *The creative sector in New Zealand: Mapping and economic role: Report to New Zealand Trade and Enterprise*. Wellington, NZ: New Zealand Institute of Economic Research.
- Ashton, D. (2009). Making it professionally: Student identity and industry professionals in higher education. *Journal of Education and Work*, 22(5), 283–300.
- Boedker, C., Vidgen, R., Meagher, K., Cogin, J., Mouritsen, I., & Runnalls, M. (2011, October). *Leadership, culture and management practices of high performing workplaces in Australia: The high performing workplaces index*. Sydney, NSW: Society for Knowledge Economics.
- Boose, M. (2011). Managing internships: experiential learning that can benefit business students, industry, and academic units. *Journal of College Teaching and Learning*, 1(1), 1–14.
- Brand, J. E. (2012). *Digital Australia*. Retrieved from the Interactive Games & Entertainment Association (IGEA) website: <http://www.igea.net/wp-content/uploads/2011/10/DA12FinalLinkVideo.pdf>.
- Bridgstock, R. S., & Hearn, G. N. (2012). A conceptual model of capability learning for the 21st century knowledge economy. In D. J. Rooney, G. N. Hearn, & T. Kastle (Eds.), *Handbook On the Knowledge Economy* (Vol. 2) (pp. 105–122). Cheltenham, UK: Edward Elgar Publishing Limited.
- Browne, A., & Hamouda, A. (2010, November). *A holistic view of 'soft' support strategies for high-tech firms*. Paper presented at the meeting of the Institute of Small Business & Entrepreneurship, Sheffield.
- Cunningham, S. D. (2011). Developments in measuring the 'creative' workforce. *Cultural Trends*, 20(1), 25–40.
- Cunningham, S. D. & Higgs, P. L. (2009). Measuring creative employment: Implications for innovation policy. *Innovation: Management, Policy and Practice*, 11(2), 190–200.
- Dalitz, R., Toner, P., & Turpin, T. (2011, August 30). *VET and the diffusion and implementation of innovation in the mining, solar energy and computer games sectors* (monograph series 06/2011). Retrieved from National Centre for Vocational Education Research (NCVER) website: <http://www.ncver.edu.au/publications/2392.html>.
- Department of Broadband, Communications and the Digital Economy (DBCDE). (2009). *Australia's digital economy: Future directions*. Retrieved from http://www.dbcde.gov.au/digital_economy/final_report.
- DeFillippi, R. J., & Arthur, M. B. (1996). Boundaryless contexts and careers: A competency-based perspective. In M. B. Arthur & D. M. Rousseau (Eds.), *The boundaryless career* (pp. 116–131). New York: Oxford University Press.
- Freeman, A. (2007, July). *London's creative sector: 2007 update* (Working Paper No. 22). London: Greater London Authority.
- Guile, D. (2006). Access, learning and development in the creative and cultural sector: From 'creative apprenticeship' to 'being apprenticed'. *Journal of Education and Work*, 19(5), 433–454.
- Guile, D. (2009). Conceptualizing the transition from education to work as vocational practice: Lessons from the UK's creative and cultural sector. *British Educational Research Journal*, 35(5), 761–779.
- Haukka, S. (2010, January). *From education to work in Australia's Creative Digital Industries: Findings from a survey of employers* (60Sox Report, Vol. 2). Retrieved from ARC Centre of Excellence for Creative Industries and Innovation (CCI) website: <http://www.cci.edu.au/sites/default/files/shaukka/60%20Sox%20Volume%202%20January%202010%20FINAL.pdf>.

- Haukka, S. (2011, May). *Working in Australia's digital games industry: Consolidation report*. Retrieved from ARC Centre of Excellence for Creative Industries and Innovation (CCI) website: <http://www.cci.edu.au/content/gisp>.
- Hearn, G., & Bridgstock, R. S. (2010). Education for the creative economy: Innovation, transdisciplinarity and networks. In D. Araya & M. A. Peters (Eds.), *Education in the creative economy: Knowledge and learning in the age of innovation* (pp. 93–115). New York: Peter Lang.
- Hearn, G. and Bridgstock, R.S. (forthcoming) *The curious case of the embedded creative: Managing creative work outside the creative industries*. In Cummings S and Bilton, C. (Eds) *The handbook of creativity management*. Cheltenham:Edward Elgar.
- Hearn, G. & Mandeville (2005). How to be productive in the knowledge economy: The case of ICTs. In D. Rooney, G. Hearn & A. Ninan (Eds.), *Handbook on the knowledge economy* (pp. 255–267). Cheltenham, UK: Edward Elgar.
- Hearn, G., & Rooney, D. (Eds.). (2008). *Knowledge policy: Challenges for the 21st century*. London: Edward Elgar.
- Higgs, P. (2011). *Creative economy report card*. Brisbane, Qld: ARC Centre of Excellence for Creative Industries and Innovation.
- Higgs, P., Cunningham, S., & Bakshi, H. (2008). *Beyond the creative industries: Mapping the creative economy in the United Kingdom*. London: NESTA.
- Higgs, P. L., Cunningham S., & Pagan, J. D. (2007). *Australia's creative economy: Basic evidence on size, growth, income and employment*. Brisbane, Qld: ARC Centre of Excellence for Creative Industries & Innovation.
- Higgs, P. L. & Freebody, S. P. (2008) *Australia's creative economy information sheet: Detailed sheets on employment in the creative segments in 2006*. Brisbane, Qld: ARC Centre of Excellence for Creative Industries and Innovation.
- Higgs, P. L. & Freebody, S. P. (2010). *Auckland's creative workforce report 2010*. Auckland, NZ: Auckland Tourism, Events and Economic Development Ltd.
- Higgs, P. L., Freebody, S. P., Anderson, P., & Cunningham, S. D. (2010). *What's your other job: A census analysis of arts employment in Australia*. Sydney, NSW: Australia Council for the Arts.
- Interactive Skills Integration Scheme (ISIS). (2012, August). *Industry engagement and graduate skills: A report on tertiary courses in interactive media and computer games*. Sydney, NSW: University of Technology, Sydney.
- Lindegaard, S. & Kawasaki, G. (2010). *The open innovation revolution: Essentials, roadblocks, and leadership skills*, Hoboken, NJ: Wiley.
- Lopez, H. & Vanhaverbeke, W. (2009). *How innovation intermediaries are shaping the technology market? An analysis of their business model*. Munich Personal RePEc Archive. Paper No. 20458.
- Miles, I. (2005). Knowledge intensive business services: Prospects and policies. *Foresight*, 7(6), 39–63.
- Miles, I. (2008). Knowledge services. In G. Hearn, G & D. Rooney (Eds.), *Knowledge policy: Challenges for the 21st century*. London: Edward Elgar.
- Mudambi, R. (2008). Location, control, and innovation in knowledge-intensive industries. *Journal of Economic Geography*, 8, 699–725.
- Muller, K., Rammer, C., & Truby, J. (2009). The role of creative industries in industrial innovation. *Innovation: management, policy & practice*, 11, 148–168.
- Ollila, S., & Elmquist, M. (2011). Managing Open Innovation: Exploring Challenges at the Interfaces of an Open Innovation Arena. *Creativity and Innovation Management*, 20(4), 273–283.

Potts, J. (2012). Creative industries and innovation in a knowledge economy. In D. Rooney, G. Hearn & T. Kastle (Eds.), *Handbook on the knowledge economy* (Vol. 2) (pp. 193–203). Cheltenham, UK: Edward Elgar.

Potts, J. D., & Cunningham, S. D. (2008). Four models of the creative industries. *International Journal of Cultural Policy*, 14(3), 233–247.

Potts, J. D., Cunningham, S. D., Hartley, J., & Ormerod, P. (2008). Social network markets: A new definition of the creative industries. *Journal of Cultural Economics*, 32(3), 166–185.

Prime Minister's Taskforce on Manufacturing. (2012, August). *Smarter manufacturing for a smarter Australia* (Report of the non-government members). Retrieved from <http://www.innovation.gov.au/Industry/Manufacturing/Taskforce/Documents/SmarterManufacturing.pdf>.

Screen Australia. (2011, November). *Playing for keeps: Enhancing sustainability in Australia's interactive entertainment industry*. Retrieved from http://www.screenaustralia.gov.au/documents/SA_publications/GamesReport_PlayingforKeeps.pdf.

Teece, D. (1986). Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. *Research Policy*, 15, 285–305.

West, J. (2006). Does appropriability enable or retard open innovation? In H. Chesbrough, W. Vanhaverbeke and J. West (Eds.). *Open innovation: Researching a new paradigm* (pp. 109–133). Oxford: Oxford University Press.