CREATIVE INTEROPERABILITY: A NEW CONCEPT TO GUIDE, UNDERSTAND AND EVALUATE INNOVATION BY CROSS-SECTOR COLLABORATION

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Keywords

Creative industries, creative interoperability, cross-industry, creative media, evaluation, innovation, intervention, innovation management, open innovation, policy, networks.
Abstract

This research focuses on micro-level assessment of research and development activities in three cross-industry interventions, each of which included digital creative media. The research occurred in the context of an Intervention Scheme funded by the Australian and Victorian Governments for two years. The Intervention Scheme was part of an international trend towards demand-driven policy experiments regarding the potential for creative industries as enablers across the wider economy. This particular initiative brokered creative industries services in three cross-sectoral projects, each operating concurrently for six months.

In each of these projects, creative media micro-businesses or start-up businesses were embedded in three host small to medium enterprises as interventions into the education, manufacturing and mining sectors. These cases were principally documented through longitudinal semi-structured interviews for the duration of the six-month intervention projects and through a brief follow-up survey six months after the projects finished. Three comparison groups of firms who were shortlisted but did not receive the intervention were also tracked. In addition, the researcher had access to documentation, and attended public events and ad-hoc project team meetings about the Intervention Scheme the cases were part of. In parallel with this doctoral research, the author was contracted to assist in evaluating the scheme. These more extensive engagements with the case studies gave the researcher an insider observer perspective, which provided background information for the interviews.

This research examines two main topics. The first topic is the role and dynamics of cross-industry collaboration in creating successful innovation outcomes. The second is the relationship between different innovation processes in different firms that enabled business/enterprise growth for both the creative media organisations and the host organisations from other industry sectors.

The research problem can be summarised in the following question: How can small and medium enterprises in different sectors use creative media to meet the challenges of innovation, and to leverage new collaborative approaches such as open innovation to maximise success? More specifically, how can creative media input
create value innovations for small and medium enterprises in the value chains of other sectors?

Following the completion and final evaluation of the Intervention Scheme, an abductive approach to building theory was engaged to explain what happened. The abductive phase became the main theoretical focus of the thesis. This process used advanced methods of complex qualitative data analysis of the interviews, and theorised the cross-sector innovations using the theory of structural holes (Burt 2009) and structural folds (Vedres and Stark 2010). The longitudinal sequence of the interviews, and the use of comparison groups who did not receive the intervention but were interviewed is noteworthy. Whilst not a randomised control group design it did assist the author in producing abductive inferences to test or at least constrain aspects of the theory development. The new concept of creative interoperability was advanced through this process, was empirically mapped and visualised, and was used reflexively to further suggest why the intervention outcomes may have occurred.

This thesis makes a contribution at the intersection of the fields of creative industries and innovation studies. In particular, the research advances our understanding of the dynamics and structures that allow innovation culture to develop, and creative and resilient networks to prosper. Finally, the implications for innovations systems, at the level of small and medium enterprises and start-ups, and policy implications for understanding the complexities for the creative economy are briefly indicated.
# Table of Contents

Keywords .............................................................................................................. i
Abstract ............................................................................................................... ii
Table of Contents ................................................................................................. iv
List of Figures ....................................................................................................... vii
List of Tables ......................................................................................................... viii
Statement of Original Authorship ........................................................................ ix
List of Publications and Refereed Conference Papers ........................................ xi
Acknowledgements .............................................................................................. xii

**CHAPTER 1: INTRODUCTION** ....................................................................... 15
1.1 Method Overview .......................................................................................... 15
1.2 Background .................................................................................................... 18
1.3 Research Questions ....................................................................................... 23
  1.3.1 Research outcomes ............................................................................... 23
1.4 Thesis Outline ............................................................................................... 24
  1.4.1 Chapter 2: Literature review ................................................................ 24
  1.4.2 Chapter 3: Methodology ..................................................................... 25
  1.4.3 Chapter 4: Qualitative descriptions of the collaborative process ........ 25
  1.4.4 Chapter 5: Intervention as catalyst of innovation culture and processes 25
  1.4.5 Chapter 6: Grounded theory: Creative interoperability of cohesive groups 25
  1.4.6 Chapter 7: Dynamic evolution of creative interoperability ................. 26
  1.4.7 Chapter 8: Conclusion ......................................................................... 26

**CHAPTER 2: LITERATURE REVIEW** ............................................................ 27
2.1 Introduction ................................................................................................... 27
2.2 From Closed to Open Innovation ................................................................ 29
  2.2.1 Twentieth-century innovation – the metaphor of Colossus ................. 29
  2.2.2 Twenty-first-century innovation .......................................................... 33
  2.2.3 Open innovation ............................................................................... 34
2.3 Innovation at the Firm Level ........................................................................ 40
  2.3.1 Organisations .................................................................................... 40
  2.3.2 Value networks ................................................................................. 42
  2.3.3 Interventions and innovation .............................................................. 46

**CHAPTER 3: METHODOLOGY** ................................................................... 53
3.1 Background ................................................................................................... 53
3.2 Intervention Scheme Host Eligibility and Selection ...................................... 53
  3.2.1 Non-participant comparison group selection ..................................... 55
3.3 Design of the Intervention and Evaluation .................................................. 56
  3.3.1 An overarching comparative case study approach ............................. 56
  3.3.2 A participatory learning approach ...................................................... 56
  3.3.3 Multiple sources of data .................................................................... 57
  3.3.4 Interview guide .................................................................................. 58
  3.3.5 Interview schedule ............................................................................ 58
  3.3.6 Comparative case design .................................................................... 59
  3.3.7 Ethical Considerations ........................................................................ 60

Creative Interoperability: A new concept to guide, understand and evaluate innovation by cross-sector collaboration
Creative Interoperability: A new concept to guide, understand and evaluate innovation by cross-sector collaboration

v
Creative Interoperability: A new concept to guide, understand and evaluate innovation by cross-sector collaboration

vi
List of Figures

Figure 1.1 Intervention Scheme and phases ................................................................. 18
Figure 5.1 Intervention Scheme and phases .............................................................. 88
Figure 5.2 Proposed IP model resulted from the Region 2 intervention project ............... 118
Figure 7.1 Discovery phase: Education intervention ...................................................... 161
Figure 7.2 Discovery phase: Mining intervention .......................................................... 162
Figure 7.3 Discovery phase: Manufacturing intervention ................................................. 163
Figure 7.4 Incubation phase: Education intervention ..................................................... 165
Figure 7.5 Incubation phase: Mining intervention ......................................................... 167
Figure 7.6 Incubation phase: Manufacturing intervention ............................................. 168
Figure 7.7 Acceleration phase: Education intervention ................................................. 171
Figure 7.8 Acceleration phase: Mining intervention ..................................................... 173
Figure 7.9 Acceleration phase: Manufacturing intervention ........................................... 174
## List of Tables

Table 1.2 *Summary of research outcomes* ................................................................. 24
Table 3.1 *Intervention Scheme participant groups* ................................................. 59
Table 3.2 *Intervention Scheme non-participant groups* ........................................... 60
Table 4.1 *Case study companies and sectors* ......................................................... 71
Table 5.1 *Outcomes for participant host firms* ....................................................... 111
Table 5.2 *Outcomes for non-participant host firms* .............................................. 111
Table 5.3 *Outcomes for participant creative firms* ................................................. 111
Table 5.4 *Outcomes for non-participant creative firms* ........................................ 112
Table 5.5 *Business problems and objectives of participant and non-participant host firms* 113
Table 5.6 *Creative firm-based business objectives of participant and non-participant firms* 114
Table 6.1 *Intervention Scheme Participants And Control-Group Non-Participants, By Region And Sectors* ................................................................. 133
Table 6.2 *Concordance table of concepts* ............................................................... 136
Table 7.1 *Interoperability theoretical framework* ..................................................... 158
Table 8.1 *Summary of research outcomes* ............................................................... 183
Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

QUT Verified Signature

Signature

Date: 06/16/2015
Thesis by Publication

Due to commercial-in-confidence, intellectual property and ethical requirements, this study has required complete anonymisation in the published papers, and hence, in the thesis. The names of all participants, organisations and projects, including the Intervention Scheme, have been changed for the purposes of confidentiality and anonymity. As a result, some qualitative detail has been eliminated; however, an attempt has been made to allow the richness of the study to be presented in the thesis, through pseudonyms and as many examples as possible. The pseudonyms used are intended to be fictional and do not relate to the true participant, organisation or project name. It may be conceivable that a fictional name used may relate to a real identity or entity; however, this should be deemed coincidental and not considered as being related to this study. The author(s) may be contacted in writing for informed consent relating to the real identities of participants, organisations and projects, including details of the Intervention Scheme.

Because of the structural features of a Thesis by Publication, it is necessary to provide some explanation of the book chapter and journal articles that have been independently published and how they have been presented in the thesis. In many of the case descriptions in the chapter/articles, there are unavoidable repetitions that were required for framing arguments and literature. In each published chapter/article, it was necessary to restate information such as descriptions of the participant and non-participant firms, the Intervention Scheme and the methodology. When possible, the repetition of information has been minimised in this thesis.

In order for the thesis to make sense to the reader, both as standalone publications and a unified piece of work, linking descriptions of each chapter and article context and rationale have been provided. The conclusions for each of the chapter/article findings are critically analysed together with overall conclusions of the research in accordance with a conventional thesis.

1 The process of anonymising was conducted in collaboration with Intervention Scheme stakeholders.
List of Publications and Refereed Conference Papers

In fulfilment of QUT’s requirements for thesis by publication, material from this study has been submitted for publication as detailed below. The candidate was the main author for the papers below. The candidate was solely responsible for the theoretical approach of the thesis, undertook all fieldwork, data collection and Leximancer analyses, and was primarily responsible for detailing the evaluation outcomes. Hearn’s role was serving on the management group of the Intervention Scheme, designing the comparative evaluation method and providing secondary feedback and guidance on the papers where he is noted as second author.


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Dedication

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For Callum
“Think from outside the box, collapse the box and take a fucking sharp knife to it.”
— Banksy (2005), Wall And Piece, Century, p.205

2 In the 2014 18th Annual Webby Awards the artist Banksy was awarded the ‘Webby Person of the Year’ in for his New York City artworks Better Out Than In. It was not awarded for a “logical connection between graffiti and the Internet” but as a “true showcase that took place on screens across the world” and serves as an illustration of the many characteristics between innovation and creative media in this study. Retrieved from website: http://webbyawards.com/winners/2014
Chapter 1: Introduction

1.1 METHOD OVERVIEW

The research problem at the core of this thesis is: How can small to medium enterprises (SMEs) in different sectors utilise creative media to meet the challenges of innovation and leverage innovation processes to maximise success? This research was achieved via micro-level assessment of research and development (R&D) activities within three cross-industry interventions that involved creative media capabilities. In these projects, three creative media micro-businesses were embedded in three host SMEs in the education, manufacturing and mining sectors. The research examines the role and dynamics of cross-industry collaboration that creates successful innovation outcomes for both partners.

The focus is predominantly at the SME and micro-business level, and examines the innovation process at the seedling stages of intellectual property (IP) creation. Theoretical analysis will pursue a particular sub-set of cross-cutting issues in innovation studies, sociology of innovation, economic sociology, network and systems theory, social networks and innovation. Additionally, these concepts are placed in the context of broader firm-level innovation management, particularly informed by open innovation. The thesis also seeks to make a practical contribution to enhancing innovation management and connections between the creative industries and the knowledge economy more broadly (Johnston 2010; OECD 2010; Ollila and Elmquist 2011; Powell and Giannella 2010; Ranaivoson 2011; RemnelandWikhamn and Wikhamn 2011; Rese and Baier 2011; Smith 2005; UNIDO 2005; van de Vrande et al. 2009).

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3 The distinction used here between micro-businesses and SMEs for the purposes of this study is that the former generally have fewer than 10 employees (often deemed a start-up if less than three years old) and the latter has greater than 10 but no more than 500 employees. The gap and distinction between the two is therefore worthy of note and this study seeks to encompass both terms in case study evaluation and empirical data.

4 Hence, the term seedling projects is preferred because this may extend to new innovation projects at the IP creation stage at all firm levels, where research is lacking.
The primary source of research data comes from longitudinal semi-structured interviews of participants in a government-funded Intervention Scheme that embedded teams with creative media skills in businesses from a range of non-creative sectors. The candidate was formally both a professional evaluator to the scheme as well as a PhD student attached to the project. This approach provided rich, descriptive and insightful empirical data from the perspective of both an internal evaluator in the form of deep, longitudinal, grounded knowledge, and an external evaluator in the form of independence, and new approaches and ideas (Hackett and Dilts 2004; Storey and Potter 2007). The research design for the evaluation of the Intervention Scheme that this thesis draws on could loosely be called a field experiment in that cases included real firms that received the intervention, as well as comparison firms who did not receive the intervention. The analysis framework for the thesis incorporates inductive and abductive methods to build case studies of the interventions, which comprised partnerships between creative media firms and host firms that were grouped into regions (Region 1: Education; Region 2: Mining; and Region 3: Manufacturing). Outcomes for non-participating firms are also described for abductive and comparative purposes.

It is very important, for the purposes of this study, to be clear that non-participants used for comparative analysis, are not deemed as formal control groups in the strictest sense, and were not selected randomly (Hackett and Dilts 2004). In keeping with Glaser and Strauss (1967), the research design was not deductive but rather inductive. It also allowed for an abductive phase oriented to gaining insight, and theory building (Timmermans and Tavory 2012). Appendix B details the Eligibility Requirements and Selection Criteria for all applications of the Intervention Scheme following responses to an Expression of Interest (Appendix A). Non-participants were not those who fell short of this Selection Criteria, but rather, were considered part of a short list of successful applicants by the Selection Committee. Thus, the applicants on the short list met the criteria advocated by Hackett and Dilts (2004) that such groups be neither too weak nor too strong to take part in the intervention. The main reason the intervention groups were selected was that among the total group of host and creative groups the best practical “matches” were chosen. Overall then, the results from the study of the non-participants provided
comparisons that yielded important insights (e.g. Storey et al. 2007), but cannot be used to infer or prove causality of the Intervention Scheme success.

Although the Intervention Scheme did not explicitly adopt an open innovation model, several aspects espouse similar values: specifically, each party was of SME/micro-business size and looking for external innovation partners beyond their vertical organisational boundaries. That is, each intervention case studied was embarking on a process whereby the goal was to generate new and innovative IP for both participating companies. Notably, the relationship between the companies was not simply a fee-for-service or supplier model. The IP created was in some way partially owned by each party, who were stakeholders in the eventual deployment of the model into the value network. Table 1.1 provides an outline of the Intervention Scheme cases and their industry.

Table 1.1

<table>
<thead>
<tr>
<th>Intervention Scheme</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant host firm</td>
<td>Education</td>
<td>Mining</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Participant creative firm</td>
<td>Education/Gaming</td>
<td>Visualisation</td>
<td>Digital services</td>
</tr>
<tr>
<td>Non-participant host firm</td>
<td>Gaming</td>
<td>Museum</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Non-participant creative firm</td>
<td>Gaming</td>
<td>Digital services</td>
<td>Gaming</td>
</tr>
</tbody>
</table>

Figure 1.1 provides a guide to the phases in which the Intervention Scheme proved to be most effective. This effectiveness was validated by each intervention project’s participatory groups. The phases of Discovery, Incubation and Acceleration (DIA) were adopted as a model, which open innovation in practice often draws on (Arteaga 2013; Lindegaard 2010). The ‘triangle’ below represents the six-month period of the Intervention Scheme.
Chapter 1: Introduction

1.2 BACKGROUND

Technology management & creative media sector: In the wake of challenges brought by the Global Financial Crisis\(^5\) (GFC), many economies, including Australia, have faced significant economic challenges. The Global Financial Crisis of 2007–08, which originated with the collapse of Lehman Brothers and subsequent banking bail-outs across the United States, United Kingdom, and Europe, has left lasting impacts. The economic downturn and subsequent market volatility have continued to be felt across these regions, and the term GFC is still being played out and possibly fully realised for Australia (Haukka 2010). The term GFC used here refers to the largely Western economic slow-down and market volatility that continued to be experienced after the initial crisis of 2008.

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\(^5\) Refers primarily to the Global Financial Crisis of 2007–08 following the collapse of Lehman Brothers and subsequent banking bail-outs across the United States, United Kingdom, and Europe. The tremors and aftershock are still being felt across these regions and the term GFC is still being played out and possibly fully realised for Australia (Haukka 2010). The term GFC used here refers to the largely Western economic slow-down and market volatility that continued to be experienced after the initial crisis of 2008.
point to the creative industries and technology sectors as sources of innovation that contribute to economic growth. In the United States, the success of the Apple products (e.g. Apple’s iPod, iPad, iPhone, etc.) illustrates how products that are mass-manufactured offshore have also led to significant growth where the IP originated: “When innovative products are designed and marketed by U.S. companies, they can create valuable jobs for American workers even if the products are manufactured offshore” (Linden et al. 2009, 9). Accordingly, the dynamics and innovations of the successful technology sector(s) are seen by many businesses competing in vertical product markets as a way of both broadening and integrating across industries and leveraging value through digital transformation. As the creative (digital) media sector continues to grow and outperform other flailing vertical sectors (automotive, retail, manufacturing), the broader problem of how to evaluate innovation extends to the very heart of the technology management practices for social and economic growth. Among the guidelines for measurement, the Oslo Manual used by the Organisation for Economic and Co-operation Development (OECD) to measure innovation statistics provides a contemporary baseline definition adopted by firms and organisations globally:

An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in-business practices, workplace organisation or external relations (OECD 2005, 46).

This definition is frequently criticised as being limited in its ability to confront concerns, for instance, of how innovation resources may be deployed, and in particular, the process of interdisciplinary collaboration. It is through Stoneman (2010) and the concept of soft innovation that it became better understood within the academic field that innovation, productivity and performance factors may have been hidden and missing from economic models. At the macro-level, globally and nationally, billions of dollars are invested every year in innovation without standardised evaluation methods that can provide an indication of success criteria and can be applied at the various stages of a project or product’s or firm’s lifecycle. Research and development at the micro-level is also fundamental to overall larger innovation systems, but is under-researched (Rahman and Ramos 2011).
Without a supportive investment ecology, innovation has been left to the markets; however, enterprises have learnt that their ability to innovate is more limited and is prohibitively costly (Bakhshi 2013). Due to the volatility of markets, invention and innovation is less sustainable now than in other periods of history since industrialisation. Specifically, Cowen (2010) suggests a post-industrial view of decline that comes through income inequality, stagnant median incomes and the GFC of 2007–08. Cowan suggests that much of the innovation from the latter-half of the twentieth century came from the application of previously discovered ideas that also cannot easily be repeated for the future (Cowen 2010). As innovation systems fail to replicate and generate new ideas, the consequences at the firm level indicate a pervasive transformation of the value chain, with new systems forming around value networks (Hearn 2006, 59). Like Cowan, many also underplay the intensity of creative destruction and the disruptive patterns of creative media technologies across multiple business sectors and ecologies by simply attributing entrepreneurship with access to these value networks (Stark 2009). However, it is also attention to the diversity of value through assertions such as soft innovation that have largely been ignored by innovation managers, innovation research and policy measures.

Creative media and open innovation: This of course poses a vast array of questions at the firm level and where we see the emergence of new forms of collaboration dynamics from the creative-media sector. An emerging paradigm is the growth of open innovation, which initially developed largely out of the high-tech industry. Open innovation is now broadening to low-tech cross-industry sectors, again, including large creative-media firms, in order to address intensifying complexities causal to large companies that struggle to innovate successfully, (Chesbrough 2011). Incubator firms are being embraced, not as solution providers, but as a holding intermediary of innovation services or product suppliers. The literature review for this study has found evidence typical within the intersection between the creative media sector and open innovation of a formation where we see large firms reaching out to smaller and nimble incubator groups as the catalyst and intermediary for innovation and investment. For large firms, this is recognition that it is often more effective to bypass (at least in the initial instance) their own organisational processes and systems of innovation. An Australian illustration of this comes from Telstra (the national telecommunications and media company): at the
time of writing, it operated a *general* innovation strategy that includes only two-year and ten-year cycles. This is a significant *value ecology* (Hearn 2006) limitation considering the technological shifts that can occur unpredictably. In general such limitations often give rise internally to *intrapreneurs* (individuals) and *skunk works* (groups) that remain outside the formal innovation systems and hierarchies, an area that *open innovation* research focuses on (Lindegaard 2010). Stark (2010) also recognises this as a significant change towards *heterarchies*, because hierarchies fail to adequately adapt to demands of the value network. Accordingly, within open innovation, this is now known as *intrapreneurialism* and is the basis for organisations to manage collaboration internally (Lindegaard 2010). The problem often being addressed by these companies is not how to fix a system, but how to organise collaboration that is often *nascent*.

Put another way, creative destruction (Schumpeter 1942) is ubiquitous within modern economies, which are undoubtedly disrupted by various forms of technology. By definition, creative digital media is one such technology-focused centre of innovation that seeks to successfully adapt its production outputs *to* and *with* technology. Even in its short time as an industry, there is evidence of disruptors operating on a *global scale* and the growth of distribution networks at an *industrial scale*. At the birth of this industry, intertwined with market-centric conditions as the main driver for growth, the notion of *flexible specialisation* suggested a mode of agility with organisations and systems (Jeffcutt 2002). However, the transformative nature of technologies also heightened the need for entrepreneurial capabilities that could navigate value networks (flexible) and remain focused (specialised), influencing continual reassessment, and thus, the unsettling of the systems, processes and organisational forms that these companies take.

*Open innovation & technology management*: Thus questions of what open innovation means for technology management and the firm are important, and even extend to considerations of how far complexities within the *networked arena* lead towards a *post-management* environment of innovation (Ollila and Elmquist 2011). In the post-GFC climate, for instance, major structural change occurred between public and private funding. The use of transformative forms of technology prompted value-network interactions at an unprecedented rate, and the impact has been significant across the technology management and, accordingly, the industry
workforce. Despite the growth of innovation and new technology, current commercial models cannot cope in making them sustainable with fluctuating international markets, off-shore competition, limited capital and increasing entrants into the workforce. As a result, these factors (GFC, transformative technology and subsequent changes to innovation policies) have led to many of Australia’s largest creative-media games companies that specialise in producing predominantly video gaming console titles for international publishers going into liquidation (e.g. Krome Studios). At the same time, smaller, more flexible and innovative companies were able to forge new and viable business models and to leverage large online distribution networks and new converging platforms. Halfbrick, for example, produces more independent-title applications self-distributed on iTunes, and thus, represents one networked form of open innovation. This specific example is one manifestation presented to Australian innovators by the momentous influence of globalised transformative technology. It is also important to interpret this major structural change as largely a US-driven technology phenomenon. Indeed perhaps the two clearest examples of global networks combining with forms of open innovation are the social media platform Facebook, which nearly 1.28 billion users (monthly active, March 2014) worldwide, and Apple’s iTunes Application (App) Store, which has had over a million application downloads (15% are games, September 2014).⁶

Many participatory networks are forming intellectual property cooperatively, as crowdsourcing and crowd-funding intermediaries of distributed (open) innovation through collaboration online (Enkel, Gassmann, and Chesbrough 2009). Three examples are:

- the open-innovation modelled InnoCentive, which connects challenges in, for example, life sciences or engineering businesses for anyone to solve;
- Ninesigma, which connects external sources of innovation to organisations across public and private sectors;

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⁶ Google Search has unknown total users worldwide; however, since 2007, it has processed approximately one billion search requests per day. All figures were accurate as of September 2014 and are available as publicly traded corporate information.
• Yet2.com, which is a technology marketplace for both buyers and sellers across products that include venture capital, patents and licensing.\(^7\)

The technical *interoperability* of online distribution systems in information communication technology (ICT) is also a driving force to industrialise the network imperative for *openness*. Openness and interoperability are both conceptual and operational drivers in innovation systems. Along with idea of *appropriability* (Teece 1986; Winter, 2006) introduced in Chapter 2, they have informed this study both in terms of theory and practice.

### 1.3 RESEARCH QUESTIONS

The broad research quest for the thesis was to understand how SMEs in different sectors could utilise creative media to meet the challenges of innovation and leverage new approaches, such as open innovation, to maximise success. Specifically:

- **Research Question 1**: How can creative media firms create value innovations for SMEs in the value network of other sectors?
- **Research Question 2**: What are the requirements for successful cross-sector collaboration between creative media companies and other sectors.
- **Research Question 3**: How can we understand the dynamics of this interaction process in theoretical terms?

### 1.3.1 Research outcomes

The research outcomes are summarised in Table 1.1. This framework provides a guide to how the outcomes are related, according to literature, method and chapter. This information is summarised further in the chapter outlines in Section 1.4.

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\(^7\) These firms are just a few examples of open-innovation intermediaries, but there are many competitors.
Table 1.1

Summary of research outcomes

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Chapter 4</th>
<th>Chapter 5</th>
<th>Chapter 6</th>
<th>Chapter 7</th>
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<tbody>
<tr>
<td>RQ1</td>
<td>RQ2</td>
<td>RQ3</td>
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<tr>
<td>Outcomes</td>
<td>Qualitative descriptions of the collaborative process</td>
<td>Intervention as catalyst of innovation culture and processes</td>
<td>Grounded theory: creative interoperability of cohesive groups</td>
<td>Dynamic evolution of creative interoperability</td>
</tr>
<tr>
<td>Method</td>
<td>Participant case studies by sector</td>
<td>Longitudinal intervention descriptions and evaluation between participants and non-participants</td>
<td>Semantic modelling of interview data</td>
<td>Semantic modelling of the evolution of the intervention through phases</td>
</tr>
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</table>

1.4 THESIS OUTLINE

1.4.1 Chapter 2: Literature review

Analysis of the literature begins with a short history of innovation as a guide for understanding the complexities of present-day paradigms. The literature reviewed discusses the implications of technological change and digital transformation, with the wider significance of value networks and innovation systems for SMEs. Subsequently, additional literature and branches for future research that resulted from this study, but were deemed out of scope to explore, are outlined in the conclusions in Section 8.7.
1.4.2 Chapter 3: Methodology

This chapter provides a description of the methods of the study. The Intervention Scheme is described, including the eligibility and selection criteria of intervention participants, the overarching grounded-theory approach, and the research design for comparative evaluation. The use of Leximancer concept mapping for building theory from the research results is also described and justified.

1.4.3 Chapter 4: Qualitative descriptions of the collaborative process

This chapter is a paper co-authored with Greg Hearn. It provides an introductory overview of the three cases in which the intervention occurred, as well as an explanation of the rationale for the Intervention Scheme and a summary of the main evaluation outcomes. A detailed comparative analysis of participants and non-participants then follows through the analysis provided in Chapter 5.

1.4.4 Chapter 5: Intervention as catalyst of innovation culture and processes

The aim of Chapter 5 is to develop a detailed comparative analysis of the three intervention cases across all phases of the intervention and of the non-participant comparison cases, at pre- and post-intervention stages. In addition, the actual outcomes of the intervention and comparison cases are evaluated against the scheme’s performance criteria. As this chapter demonstrates, the intervention did have significant real-world commercial outcomes that can be partly attributed to the Intervention Scheme. This highlights the significance of the research opportunity in this thesis: the chance to observe a large, well-funded, real-world experiment that lasted for two years. This chapter also describes the innovation processes and their effects, which are then theorised in novel ways in Chapters 6 and 7. This chapter, authored solely by the candidate, is based on the formal evaluation report of the Intervention Scheme.

1.4.5 Chapter 6: Grounded theory: Creative interoperability of cohesive groups

In this chapter, the innovation processes evidenced in the Intervention Scheme are theorised in novel ways. The use of Leximancer software to assemble the interview transcripts into semantic network forms is explained and justified. In addition to describing the semantic network structure that operated in the Intervention Scheme, the idea of creative interoperability is introduced. This modelling process was a painstaking part of the thesis, requiring the assessment of
various software options and lengthy empirical testing of each. This chapter is a paper co-authored with Greg Hearn.

1.4.6 Chapter 7: Dynamic evolution of creative interoperability

This chapter is a paper in which further semantic network analyses are conducted using the interview transcripts, and the longitudinal change in the semantic network structure throughout the intervention is mapped. This is theorised in terms of the theoretical difference between structural holes (Burt 1992) and structural folds (Stark and Vedres 2013). The importance of structural folding for creative interoperability is argued for, and demonstrated. The candidate is the sole author of this chapter.

1.4.7 Chapter 8: Conclusion

The conclusion chapter provides an overview of the outcomes for preceding chapters, together with a discussion of results. An analysis responds to the objectives of the research in the introductory chapters, including the thesis research questions (in Section 1.3). Areas of future research (Section 8.7) are also provided, including summaries of pathways to literature.
2.1 INTRODUCTION

Much innovation occurs at the firm level with seedling projects, ranging from start-up ventures, to intrapreneurship in larger organisations and institutions. As we have seen with the surge of creative media and ICT growth, for example, in the United States and more recently in South East Asia, innovation can contribute enormously to regional, national, and indeed, global economies. The literature reviewed identifies the importance of technological change in value networks, with wider implications such as sustaining the growth, jobs and skills necessary to successfully digitally transform across intersections of industry. Although not the core focus of this study, the broader implications for innovation systems at the national and global level are important to acknowledge in terms of the significance of this project. Specifically, the Intervention Scheme, the central focus of this research, is the result of a series of government-funded policy and program initiatives, which purposely discern the transformative connections between the creative industries and innovation.

In evaluating technological change, the recent report by Deloitte Access Economics (2011) for Google Australia, *The Connected Continent: How the internet is transforming the Australian economy*, suggests that the direct contribution of the internet industry to the overall Australian economy for 2010–2011 is 3.6% of the average Gross Domestic Product (GDP) per annum or approximately AU$50billion. This figure is almost equivalent to the GDP per annum for the same period of Australia’s iron ore industry, which has been its dominant export industry over the last decade. The report also acknowledges that this measurement of the internet industry does not include potential wider benefits, such as productivity in business and benefits to households, so the impact of the internet may run much deeper – to as much as AU$80billion. Importantly, the report also identifies a significant
contribution of this growth – including exports – to innovative online businesses, which are predominantly SMEs.\textsuperscript{8}

The literature also suggests that these shifts towards internet-related industries have paralleled the coming of open innovation, which further deepens new forms of change and raises questions about how these dynamics of innovation may be measured. One such measure offered as an alternative that is solely reliant on tangibles is the triple bottom line accounting method, whereby a company additionally reports in its balance sheet environmental and social performance (Elkington 1994). This example of non-fiscal factors illustrates the fact that economic measures are being re-evaluated themselves as narrow and lacking the insights necessary to embrace new forms of corporate change, such as sustainability and growth necessary at the firm level. When placed in the context of the creation-discovery stages of seedling innovation, from the insight of Vollbracht (2011), we can see that measurement and evaluation through the lens of economic models that focus solely on finance are largely inappropriate:

(1) financial information is a lagging indicator, a “rear-view mirror” of the company’s performance and an imperfect predictor of future financial performance, (2) nonfinancial information can provide insights into the company’s expected future financial performance, and (3) for most companies their market value exceeds their book value so additional reporting can provide information on a company’s intangible assets that are not captured on the balance sheet (Vollbracht 2011, 74).

This is not to say that economic models are irrelevant; in fact, according to Vollbracht and many open innovation theorists, it is not necessarily the best innovation that wins the day, but rather the better business model (Chesbrough, Vanhaverbeke and West 2006). Part of the dark art of innovation is indeed the challenge of converting the intangible to tangible. Appropriate and relevant evaluation that can scale with these challenges to the advanced stages of management and market-driven business modelling is therefore critical. As such, the review of literature is grouped into three key areas: (i) closed and open innovation;
(ii) firm level innovation and (iii) measuring innovation. These key themes will enable a strategic analysis of the nature and changing interpretation of innovation.

In order to evaluate innovation, I argue that the single-organisation hierarchies are giving way to external heterarchic clusters of collaboration. Therefore, evaluation frameworks of firm-level innovation need to be combined with a framework of assessment that adequately accounts for twenty-first century forms of soft or hidden innovation, which are more complex and diverse than at any other period in history. This thesis also presents a case for interoperability as a guide during the creative stages of innovation, and may be applied to any point of the business model when collaboration is required. This is termed as creative interoperability. This framework will be shown to be relevant to evaluating SMEs and the creation-discovery stages of cross-industry R&D collaboration activities such as seedling or pilot projects, small or start-up firms.

2.2 FROM CLOSED TO OPEN INNOVATION

2.2.1 Twentieth-century innovation – the metaphor of Colossus

We can trace over the last century the change in attitudes regarding collaboration and innovation through the tangible notion of open innovation. Colossus, the world’s first electronic, digital, programmable computing device, was created by the British in 1943 specifically to decipher enemy encryption messages during World War II. Colossus is an intriguing historical example that provides a particularly closed form of innovation from which to consider twentieth-century innovation. In particular, it is the post-war concealment surrounding code-breaking (encompassing the notorious Enigma machines), necessitated by the activities of the Cold War, that meant that the innovations of Colossus were not openly revealed until the 1980s, long after its technology had been surpassed. According to Copeland (2010), Churchill ordered the destruction of most of the Colossus machines into pieces no larger than the size of a hand; the schematics for the machines were also destroyed. Although in Colossus we see some signs of open innovation in the technology-driven collaboration process (expertise was indeed brought in), more notably, this occasion featured closed and hidden innovation distributed according to how the hierarchic military value chain was organised.
A more typical starting point when discussing innovation – and a theoretical perspective emerging during the same period as Colossus – is Joseph Schumpeter’s (1942) *creative destruction*, which, for the first time, placed innovation profoundly at the core of capitalism and economic growth. Prior to Schumpeter, economists in particular scarcely recognised innovation systems such as R&D as part of economic growth because they were viewed as *exogenous to the economy* (Freeman 1997). In other words, complexity that occurred from outside the national innovation system, such as the noted globalising structural disruption of US online platforms, is still not considered a growth factor nor is it adequately measured by policy. Though he initially derived the term from Marx, Schumpeter developed *creative destruction* into his own economic theory, that of innovation intertwining with waves of entrepreneurship.10

Of core interest to this study is the emphasis Schumpeter’s theory places on cycles of innovation at the centre of the economy that continually generate opportunities arising out of the destruction, or mutation, of a previous economic system. In particular, it is the sequence from competition, to monopolisation by a small number of large companies, and then back again, that materialises most frequently in the literature (Schumpeter 1942). The conundrum of Colossus is that it may seem to contradict Schumpeter in that technology-driven motives and success measures were not bound to market-driven forces. It is in fact the clandestine origins and Cold War climate that affected the government-sponsored research that ultimately prevented the innovations of Colossus reaching and affecting the commercial market, which Schumpeter calls the process of *diffusion* (Stoneman 2010). The original intent and remarkable achievements in wartime cryptography notwithstanding, the subsequent post-war focus on the single application that monopolised deciphering and encryption code-breaking may have contributed to

10 Schumpeter is most often criticised for lacking empirical study, and hence, innovation literature has been developed to analyse in practice the difference between technology-driven and market-driven disruptive models (Habtay 2012). Schumpeter also remains valuable in relation to innovation-management discourse, in which we see the rate of change and lack of willingness to cannibalise existing innovations for use in new businesses. Schumpeter conceptualised the process of change into three stages, *invention, innovation and diffusion*. As Stoneman (2010) points out, “although, for Schumpeter, *innovation* encompassed a single stage in the overall technological process, the term is now used widely to encompass all three stages and everything that the process involves”. This concept is fundamental to open innovation in terms of evaluating the *capabilities needed for managing discontinuous change* (Rohrbeck and Gemünden 2010).

Chapter 2: Literature Review

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hiding Colossus as the “first electronic, programmable, digital computation device” (Wells 2010, 1383); despite the monopolisation, the cryptographic use is now an intriguing historical by-product.\textsuperscript{11} It is not possible to fully understand whether the 40 years that Colossus remained secret would have altered the course of modern computers and directly influenced economic change. However, given the importance of \textit{boolean search}\textsuperscript{12} at the core of computer software and internet technology today, it has been conceived that public knowledge about Colossus could have changed modern computing, even perhaps making it more advanced (Copeland 2010).

In reflection on Colossus as a metaphor for twentieth-century innovation, computing innovation emerged out of an open environment that we can see was characterised by a series of revolutions that ensued, shadowing the Schumpeterian theoretical model. Since one of the most significant computing innovations, the 1971 dawn of the microprocessor – which incidentally occurred with only a minor influence of Colossus (Castells 2000) – the computing industry has followed a creative destructive cyclical pattern in the form of \textit{Moore’s Law}\textsuperscript{13} (Chesbrough and Spohrer 2006). From an innovation collaboration perspective, the body of knowledge that may have grown and hence publicly developed around programmable computing – rather than solely in Cold War cryptography – has evidenced a failure to exploit, or diffuse, arguably one of its most formidable innovation projects. As history has shown, modern programmable computing finally emerged out of the United States (alongside the creation of the semi-conductor) in the late 1960s and 70s,\textsuperscript{14} spawning

\textsuperscript{11} It has been conceived that the fate of Colossus became intertwined with the Cold War, a war in which information intelligence was central to battlefield dominance (Hearn 2011). During this period, UK intelligence agencies created an economy selling to other governments Enigma-like cryptography machines, the codes of which the UK intelligence agencies were subsequently able to de-crypt. Had other cryptography methods been introduced, such as those of Colossus, the UK may not have retained its monopoly and commercial control, and may not have been able to continue selling “outdated cryptographic products to third world countries for decades” (Wells 2010, 1387).

\textsuperscript{12} Programmable boolean algorithms were central to the Mk. II Colossus machines, which today are fundamental in modern computing: for example, Google, along with many popular Web Search Engines, uses such technology.

\textsuperscript{13} Moore’s Law asserts that steady increases in processor speed and storage size have become as predictable: 18 months to 2 years is the current standard for the speed of a processor to double (Pavitt 1998).

\textsuperscript{14} This rise of computers out of the United States is well documented in the \textit{Annals of the History of Computing} (Wells 2010).
an ICT revolution (Castells 2000). As established earlier, the United States retains dominance in technological innovation globally with information technology (predominantly software products and services) remaining a leading industry of growth and investment to its overall GDP. Combined with a Schumpeterian assessment, it is therefore conceivable that the true significance of Colossus beyond goals of a singular monopoly (in cryptography) was grossly underestimated.

Such conjecture, however, does exemplify creative-destruction cycles and offers insights about the complexity brought by constant technological change and differences between twentieth and twenty-first-century paradigms. One of the Colossus contributors, Allen Coombs, although unable to discuss his achievements until information regarding Colossus was declassified, recognised the beginning of this shift in technological paradigms with his quip that the field of digital programmable computing was full of endless possibilities (Coombs 1983). From 1945 to the 1980s, the open pursuit of the Colossus path of programmable computing effectively ceased in Britain. As with many of the key personnel, Coombs instead progressed other fields, in his case, the pattern recognition commonly used today as Optical Character Recognition (OCR). The centre for Colossus collaboration, the Post Office Research Station, for decades continued to innovate with many notable staff and today, perhaps ironically, is also a site of much open innovation (Sato 2010). Now, from a twenty-first-century perspective, some disruption at the group level can be beneficial and have performance-enhancing effects. That the Colossus team achieved similar advances is possibly explained as group evolution recombination contributing to a creative destruction that disperses group members who become available for later regrouping (Vedres and Stark 2010).


16 The Post Office Research Station is said to have begun experimental work in collaboration with the telephone and telegraph services of the General Post Office from 1878. The activities of the Research Station expanded steadily during the inter-war periods, and during World War II, it was diverted to deal almost entirely with objectives having immediate military application. Based in Dollis Hill, North-West London, UK, it achieved many innovations from 1933 until 1968, when it finally relocated and eventually became BT (British Telecom) Research Labs.
2.2.2 Twenty-first-century innovation

A considerable volume of, often polarising, academic debate has developed around Schumpeter’s (1942) creative-destruction treatise across many scholarly fields. One such issue of relevance to open innovation is the development of the new generation of endogenous growth theory (Howitt 2007). Predictably, contemporary critiques of Schumpeter range from sociology network theorists (Castells 2010) to post-modernists (Berman 1983; Harvey 2004). Schumpeter conceptualised the process of change into three stages: invention, innovation and diffusion. As Stoneman (2010) points out, “for Schumpeter, innovation encompassed a single stage in the overall technological process, the term is now used widely to encompass all three stages and everything that the process involves” (Stoneman 2010, 2; emphasis added). This concept is fundamental to open innovation in terms of evaluating the capabilities needed for managing discontinuous change (Rohrbeck and Gemünden 2010); scholars and practitioners recognise the stages adapted for use in the open-innovation framework of discovery, incubation and acceleration (Lindegaard 2010).

In particular, one concept for which Schumpeter remains valuable within current innovation-management discourse is the emphasis on the rate of change coupled with the lack of willingness to cannibalise existing innovations for new business(es).

Also important for debates surrounding accounts of innovation in the creative industries is Schumpeter’s model connecting entrepreneurs and artists: he viewed artists as economic agents to explain the role of the entrepreneur in his theory of innovation (Hartley 2014). Creative destruction is the dynamic process by which entrepreneurs introduce innovations through disruptive technologies. This process of transformation forms, among others, the basis of evolutionary economics: an ecosystem of heterogeneous disciplines inspired by economics, evolutionary biology and cultural science (Hartley 2014). Thus, in the twenty-first century, post-industrial economics, such Schumpeterian definitions of economic evolution prevail in understanding change and transformation dynamics affecting the firm. The discontinuous/continuous destruction cycles have transmuted into the drivers of disruption so frequently and commonly referenced in technology-management practice today (Bower 1995; Christensen 1997; Massa 2008). It is notable that the OECD (2006) remains drawn to Schumpeterian concepts of innovation in its Oslo Manual (2005), while largely ignoring the insights that evolutionary economics
offers in understanding the transformative (disruptive) processes for successful innovation. It is argued that the Oslo Manual is the “yardstick by which statisticians, economists and policymakers in most OECD countries have measured innovation and innovative activity” (Stoneman 2010, 16), but that this focus on mainstream definitions of innovation becomes too narrow to accommodate post-industrial innovation (Cunningham 2013). Contemporary debate about innovation now encompasses or acknowledges that considerable amounts of innovation is hidden and generally disregarded in the study of innovation by the field of economics (Stoneman 2010).

Disruptive and destructive processes of innovation, and how they recombine, remain among the most complex to arise from the twentieth century. To understand these processes, dynamics and structures, the nature of change must be redefined beyond a view in which it is limited to entry into new and existing markets. Stoneman (2010), for example, suggests this lacks consideration of both non-market institutions and of entering a new market for the first time. It is obvious in contemporary economic literature that innovation demands not just technology invention but also systems of economic change from that technology (Freeman 1982, 1995, 2002). One such measure that accounts for economic change is appropriability, which allows the innovator to capture and return value created by the innovation (West 2006; Winter 2006). For example, organisationally, skills that are vertically engrained within a firm lack reproducible qualities and have weak appropriability. Tracing and exploring the concept of appropriability therefore provides a contextual and relevant measure of innovation for comparative analysis and appropriate evaluation. This in turn may serve to inform the modern-day rhetoric, which maintains that without appropriability balances, it is likely that today there is too little innovation of value (Stoneman 2010). Appropriability is particularly poignant for technological product and process (TPP) innovation, but it is also relevant for the aesthetic and intangible forms of innovation that are being sought by those pursuing open innovation.

2.2.3 Open innovation

To mobilise the changes necessary to innovate, over the last decade, leading organisations have begun to look towards new paradigms and models. In the formation of modern-day innovation, we see collaborative innovation merging with
the network perspective under the concept *open innovation* (Rohrbeck and Gemünden 2010). Open innovation is not necessarily a new phenomenon; indeed, Chesbrough (2003), who first coined the term in 2003, notes that open innovation’s principle doctrines, that of cross-industry and inter-firm collaboration around R&D, date back at least five decades. Chesbrough’s initial definition remains worthy of note:

> The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively. Open innovation is a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology (Chesbrough, Vanhaverbeke, and West 2006, 2).

In what began in its early stages as a theoretical framework among academic researchers to address issues of innovation, open innovation has slowly gained acceptance among both academics and industry over the past decade. More recently, we have seen new forms of open innovation ecosystems as subsystems emerge and evolve endogenously (Bogers and West 2012). Discussed alongside technology management at the firm level, one such subsystem is the rise of complex networks of intensified collaboration, exemplified in some of the open innovation networks described in Chapter 1. We can also see this imperative spreading from high-tech industries into low-tech arenas (Enkel, Gassmann, and Chesbrough 2009). The open innovation literature widely examines co-creation within particular fields of endeavour, and of these fields, the automotive industry, medicine, health, pharmaceuticals, telecommunications and defence are the most researched (Chesbrough, Vanhaverbeke, and West 2006; Lakhani, Lifshitz-Assaf, and Tushman 2012; Vanhaverbeke and Cloodt 2006; Wynarczyk and Piperopoulos 2013).

The first form of open innovation happens when a firm or organisation looks openly to collaborate, seeking new ideas externally to stimulate the innovation creation or distribution process. The drive for external mobilisation comes when an organisation acknowledges that “not all the smart people work for us” (Enkel, Gassmann, and Chesbrough 2009, 311). A second form of open innovation comes when open innovation is used by organisations who have identified internal problems of mobilisation and subsequently overcome organisational roadblocks and cultural
challenges. Typically, these types of challenges are faced by larger organisations, institutions and corporations (Lindegaard 2010). One such challenge is the ability of organisations to overcome forces fiercely dedicated to maintaining the status-quo rather than innovating. As Schumpeter (1942) suggested, the effects of managing discontinuous and continuous change also produce new forms of entrepreneurship. Growing within larger organisations, for example, are notions such as intrapreneurs,¹⁷ that is, an entrepreneur motivated to innovate from within an organisation. Literature suggests that the intrapreneur acts with autonomy within groups, recombining resources, almost in contradiction to organisational structure and culture, as well as being largely outside (or hidden) from traditional fiscal reporting methods. Therefore, to evaluate open innovation and begin to identify principles, it is also useful to examine organisations and organisational systems empirically, as a site of world-class best practice that is driving innovation today.

For example, traditional empirical research remains concerned with measuring roles and inter-organisational relationships in permanently closed groups. In these closed groups, Gemünden et al. (2007, 416) reveal that a “troika of expert, power and process promoter” performs less well when technological innovation increases. They conclude that previous innovators, that is innovators of the past, may want to stay on their (now) traditional trajectories. Surprisingly, this suggests that it is technologists within the creative industries who are often guilty of curbing innovation and growth because they are unable to adapt and recombine to new principles of change:

In cases of radical innovation, it is more likely that the innovators also have to master organizational and societal change, and changes in competition. How much change is required should be taken into account more thoroughly ... higher market potential and value creation does not always imply higher barriers and more difficulties. It is a genuine task of finding the intelligent combinations (Gemünden et al. 2007, 417).

Gemünden et al. (2007) map innovation measurement against radical innovation (Arteaga 2013; Leifer 2000) in what they term an era of open innovation supporting a shift in paradigm of significant organisational change. They argue for

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¹⁷ Although forms of open innovation often focus on the term intrapreneur, it was first coined as a way of distinguishing entrepreneurs who are more externally situated (Lindegaard 2010).
the agency of open innovators, who must continue to change and adapt themselves. In comparison, Ranaivoson et al. (2011) argue that the organisation of innovation should be adapted so that it allows innovators to make what and how fit structurally. As with appropriability, the balance of openness may be conceived as a measure. Equally, the risk and consequences of openness may be similar to concerns of appropriability: high openness and appropriability are also detrimental because being highly reproducible suggests difficulty in maintaining competitive and market advantage for sustainable periods.

From its theoretical origins, open innovation has been gaining momentum in practice over the past 10 years, encompassing a paradigm shift in which organisations look beyond internal and vertical boundaries for innovation (Bogers and West 2012). It is a unifying theory of innovation that this research has leveraged to explain co-creation and phenomena that have occurred within the scope of study. Open innovation has been warranted for larger firms’ innovation that is confined within the internal processes and/or R&D structures in the single organisation. The theory usefully shifts paradigmatically from the value chain to the value network, introducing new and multiple stakeholders and resources that externally engage in the innovation process. According to this shift in perspectives, research about open innovation has revealed many challenges and implications, including those unleashing the explosive potential of (user innovation) networks and phenomena such as crowdfunding and crowdsourcing (Mollick 2012; Naroditskiy et al. 2013). Innovation managers facing these challenges are recognising the strategic importance of collaborative R&D networks as firms look to accelerate innovation cycles, mitigate costs and maximise success criteria (Enkel 2010). The characteristics of these networks are analogous with contemporary technological systems and distribution processes that combine with the heuristic methods; for instance, crowdsourcing is a composite mix of online communities, user (generated) innovation and social media (von Hippel 2012). This is evident with the growth of third-party open-innovation intermediary businesses, who are increasing in prominence and success.  

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18 Many of these businesses will be identified and referenced throughout this thesis.
It is important to revisit the origins of open innovation: it began with large firms, predominantly in the ICT industry, that were looking for alternative interorganisational and collaborative (technology) channels for innovation (Chesbrough, Vanhaverbeke, and West 2006). There are significant studies of open innovation broadening into other sectors (e.g. pharmaceuticals, automotive and aerospace manufacturing, and fast-moving consumer goods\(^{19}\)), together with the growth of value networks that promote deepening beyond single large-technology organisations and their suppliers. These origins, however, pose questions about the skills and knowledge requirements, which are prerequisites to engage open innovation.

Fittingly, as open innovation networks increase, the needs and demands of the value network extend and depend on the grassroots innovations of SMEs. Omitted by mainstream literature, there is very little research into the adoption of open innovation strategies and practices applied by SMEs, despite their importance to innovation and the overall national economy (Lee et al. 2010; Rahman and Ramos 2011; van de Vrande et al. 2009). Among the challenges is that open innovation (as with innovation) is conceptually ambiguous, varying in definition, and as such, it is seen to lack consistent ways to evaluate and measure the success criteria needed to prove effectiveness. Because open-innovation networks are a relatively recent phenomenon, this may explain why the adoption rate of open-innovation strategies by SMEs remains well below expectation (Rahman and Ramos 2011). Possible explanations may be the extent to which open-innovation value networks have trickled down to the SME level to be successfully implemented. Alongside this is the inquiry into whether the application of open innovation is dependent on technology skills (such as those within the interactive-media sector) to be successfully adopted by SMEs.

The most recent and relevant work in this area is through Vanhaverbeke (2009), who has been among the first to turn the focus of open innovation from large and high-tech firms to SMEs (Chesbrough, Vanhaverbeke and West 2006). Through this analysis, we can see the importance of the business model being central to

\(^{19}\) Examples in these sectors are Gassmann (2004), Dodgson (2006) and OECD (2008).
maximisation of success, together with SMEs being a critical component with the overall flow of the value network. Among the most interesting observations is that the application of open innovation to these business models with strategies embraced by SMEs were found to be creative and discovery-led rather than being led by broader macro-strategy business growth (van de Vrande et al. 2009). Value network distribution was also found to be heavily reliant on close business relationships, often between companies of similar or equal size (Vanhaverbeke and Cloodt 2006).

Scholars of both creative industries and open innovation systems argue they are drivers of both supply and demand (Müller, Rammer and Trüby 2009; Vanhaverbeke 2009). It could be argued however that open innovation offers little by way of identifying the intangibles associated with creativity and innovation itself, other than pointing towards processes that support external intermediaries. Though not overtly defined as open innovation, the context of the research in this thesis is a program and policy experiments that connects the creative sector to potential demand for its services in the wider economy. The intervention scheme as well as the product of these demand-driven creative industries initiatives also fulfils the role of external intermediary. The action research thus not only provides insights of how innovation challenges were met between groups, but also what open innovation dynamics and network structures are relevant when applied cross-sector and by small businesses including start-up ventures.

To reiterate, cross-industry analysis is the research problem at the core of this study: How can SMEs in different sectors utilise interactive media to meet the challenges of innovation and leverage new approaches such as open innovation to maximise success? The research focuses on the micro-level assessment of R&D activities in three cross-industry, creative-media projects. In these projects, interactive-media micro-businesses are embedded in three host SMEs in the education, mining and manufacturing sectors. The research has two focuses: first, the relationship of open innovation with business/enterprise growth for both interactive media and host organisations; and second, the role of cross-industry collaboration in advancing open innovation.

Theoretical analysis will draw on current issues of innovation studies, economic sociology, and network and systems theory. The implications for skills and policy development will also be examined. The focus is predominantly at the SME
and micro-business level, while examining the innovation process at the seedling stages of IP creation. Qualitative research will supply data to narrow the research analysis, and in addition, these concepts may eventually be placed in the context of broader firm-level innovation and innovation management of seedling projects. It is hoped therefore that effective open-innovation measurement as a framework may lead to enhancing innovation management and further connections between the creative industries and development of the knowledge economy (Development 2010; Johnston 2010; Ollila and Elmquist 2011; Powell and Giannella 2010; Ranaivoson 2011; Remneland-Wikhamn and Wikhamn 2011; Rese and Baier 2011; Smith 2005; UNIDO 2005; van de Vrande et al. 2009). Future directions for collaborative innovation are identified and examined in Chapter 8.

2.3 INNOVATION AT THE FIRM LEVEL

2.3.1 Organisations

One of the key challenges that is commonly touched on for all forms of innovation is how the organisation’s structure builds resilience and an absorptive capacity in its resources required by innovation complexity (Cunningham 2013). An integrated innovation framework proposed by Nada (2010), for example, sees organisational strategy and structure as a critical dimension of a framework for innovation management. However different groups in organisations describe innovation differently. Stark (2009) identifies the disagreement between groups and the principles of worth as dissonance. Stark (2009) uses ethnographic fieldwork and social network analysis to provide a useful beginning in his work, The Sense of Dissonance, for understanding such organisational incongruities within innovation, creation and production. In examining organisational forms as sites of multiple evaluation principles, or accounts of worth, he has carried out field research that surveys organisations, finding new degrees of connectivity and networks of elements such as heterarchies, predominantly with medium to large-sized firms. Each element

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20 The distinction used here between micro-businesses and SMEs for the purposes of this study is that the former has fewer than 10 employees (often deemed a ‘start-up’ if less than three years old) and the latter has greater than 10, but no more than 500. The distinction between the two is therefore worthy of note and this study seeks to encompass both terms in case-study evaluation and empirical data.

21 Hence the term seedling projects is frequently preferred because this may extend to new innovation projects at the IP-creation stage at all firm levels.
shares the same horizontal position of power and authority, each playing a theoretically equal role (Stark 2009). This concept is particularly informing, and one that this thesis takes issue with by asking how it extends, not only to large organisations, but also, potentially, towards SMEs, which most often include start-ups and seedling projects.

Stark (2009) provides the conceptual foundation for exploring differences between hierarchies and network and systems theory (although this thesis looks towards case studies as its method for evaluating open innovation, rather than Stark’s ethnographic and network approaches). Nevertheless, Stark (2009) provides an advanced conceptual approach to evaluating the innovation process, which acknowledges distributed intelligence and the diversity of evaluative principles in organisations. For example, Stark (2009, 9) notably points to a shift in the economic sociology of worth that motivates actors:

…so can economic sociology move from studying the institutions in which economic activity is embedded to analyzing the actual evaluative and calculative practices of actors at work.

We see conspicuous examples around the sociology of worth in the shift in how seedling ventures have managed risk and reward over the past 10 years. Prior to and during the dot-com bubble of the late 1990s and early 2000s, risks were carried largely by investors, mostly due to the fact that although there were low fiscal revenues, there was high projected worth. Since the dot-com bubble and the GFC, economies now place the onus of risk away from investors but onto the founders, implying that perceptions of worth are often cyclical: more risk equals more reward. For organisations that wish to embrace innovation, and that also have to embrace organisational and cultural change, the risks are high, but without the (at least immediate) rewards. This is particularly so within competing networks with a lack of the necessary agility for organisations to adapt and retain agency and structure enough to invoke the cultural change essential for innovation.

What is intriguing at the firm level is that within these factors, there is an abundance of different goals and notions of worth motivating actors in an organisation. With different notions of what is valuable, Stark (2009) argues, organisations can be equipped to succeed in a search in which what they are searching for is unclear. Stark (2009) uses this as the very core of his definition of
innovation; that is, *dissonance* and the disagreement about the principles of worth can lead to innovation and invention. As we have seen previously in the case of Colossus, heterarchic collaboration appears among the most hierarchic environments (e.g. the military). However, the role of hierarchies to the market-driven process and the value network remains an important question at the firm level of SMEs.

### 2.3.2 Value networks

Using Stark (2009), we found that in examining organisational forms, there are numerous evaluation principles, or frameworks of worth, as a result of heterarchic distributed knowledge. As discussed earlier in network terms, creative destruction and disruption occurs when entrepreneurial structures produce innovation *recombinations*. This is an important concern that this thesis draws on concerning how far these entrepreneurial groups recombine to structurally fold, and to what extent this is relevant to small enterprise. Lindsey (2011) suggests that these are structural forms of *entrepreneurial innovation* that continually reform within economic development. Consequently, we can see the dual effects of these new regrouping recombinations: group performance is released, at the cost of group stability (Vedres and Stark 2010). We can conclude that the perspective of open innovation itself is indeed a form of a *recombining* of collaboration structures for innovation:

> More recently, the network and collaborative innovation perspectives were merged under the term open innovation. The term has been used to express the ability of an organization to sense change and acquire needed capabilities (Rohrbeck and Gemünden 2010, 233).

Further, within open innovation, there is evidence of new forms of collaboration, agency and structure *dispersing* across enormous global participatory *value networks.* For open innovation and the need for collaboration beyond internal organisational boundaries, the network imperative is fundamental to the notion of interorganisational innovation (Enkel, Gassmann, and Chesbrough 2009). The network imperative alone is not a new notion; we can chart the basic rule of the

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22 There are also many open-innovation platforms appearing such as InnoCentive, BountyQuest, TopCoder and 99Designs, as well as many extensions to institutional government, educational and corporate networks and to non-for-profits such as X-Prize.
network back as early as 1908, when Bell Telephone boss Theodore Vail explained that the more people who use the network, the more useful it becomes to each user (Mason 2012). Today, macro-level forms of distribution networks have become vast indeed, reaching immense audiences. For the entrepreneur or innovator, small or large, broad technology networks such as Google (e.g. Adwords), Apple iTunes store, Facebook and Twitter are a few among many that can be leveraged in some capacity for interactive engagement across promotional marketing, direct distribution and, of increasing importance, collaboration. For SMEs, often the potential of these networks seems obvious; however, the interorganisational implications for entry to these value networks, and the prerequisites (such as a bias to high-tech knowledge and skills), are increasingly important for sustainability and growth beyond traditional approaches to innovation.

Through social networks, Potts et al. (2008) point to the idea that specialised knowledge is practice and the more innovative the knowledge, the more difficult it may to be to transmit knowledge across networks. Hence, as they observe, markets that are organised as social networks concerning the creative industries are drivers of innovation supply and demand (Potts et al. 2008). This can be seen to present a challenge for the open-innovation value network. With the upsurge of participatory value networks, there is the potential for forms of greater intensity of innovation through collaboration. In the open-innovation framework, this in turn requires the participation intermediary to prove the familiarity of simple language and practice (Vedres and Stark 2010). However, a deepening question for technology management is how to then connect, control and exploit that knowledge into viable business models. One possible reaction surrounds the phenomenon of crowdsourcing platforms that fulfil at least part of the role as participation intermediary:

The amount of knowledge and talent among the human race has always outstripped our capacity to harness it. Crowdsourcing corrects that – but in doing so, it also unleashes the force of creative destruction (Howe 2009, 12).

In his 2009 book, journalist and writer Jeff Howe used the term crowdsourcing\textsuperscript{23} to identify a new form of community integration and engagement.

\textsuperscript{23} Howe first coined the term in a 2006 article he wrote for \textit{Wired Magazine}. 

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\textsuperscript{23} Howe first coined the term in a 2006 article he wrote for \textit{Wired Magazine}.
with the formation of collaborative value networks. Howe identified that crowdsourcing activates the transformative power of today’s technology, but warns that as traditional forms of labour are displaced, so too there are inevitable consequences: in addition to bringing opportunity, certainly these networks bring complexity, and with that, risks and turbulence. In the creative-media industry, crowdsourcing is a phenomenon of agency forming around the ability to leverage these enormous distribution networks based on how best to mitigate risk and maximise worth; that is, the agility to restructure creation and production. We therefore return to Stark (2009): in order to adapt to competition and nascent opportunities, his research reveals that entrepreneurial agency operates similarly to (in his case study, trading room) brokers looking for structural loopholes. By its own virtue, entrepreneurial innovation, or entrepreneurial capitalism, seeks to challenge and change structures, whether they be socio-technical, economic or even political.

Stark (2009) suggests that instead of brokering structural holes to bridge the gap between access to knowledge, entrepreneurialism should be understood with regard to the interorganisational overlaps, such as coexisting diverse values, that generate new knowledge. It is these overlaps, placed within network theory, that this study aims to reveal, with particular reference to the role of the intermediary in the value network at the micro or SME level. These overlaps are precisely the areas identified for this research project to investigate and evaluate through each of the research intersections where groups successfully collaborate, and more importantly, creatively interoperate.

The role of the broker is the focus of much recent critical review (e.g. Pachucki and Breiger 2010). Further, as methods such as qualitative network data analysis have advanced insights into social structures, theories examining “cultural meanings, practices, and discourse” have also begun to be developed in investigations of innovation creation and collaboration (Pachucki et al. 2010, 215). Both these movements are important to this thesis.

For example, Ronald Burt (2009), in social network analysis, advanced the idea of bridging structural holes:

Burt’s idea refers to strategic bridging ties that may connect otherwise disjointed clumps of social actors; these ties are hypothesized to lead to
enhanced information benefits and social capital for those who bridge holes.  
(Pachucki et al. 2010, 215)

While Burt has been seminal in developing the topologies of information and idea flows in social network theory, some researchers have questioned whether his work fails to notice “cultural holes” (Pachucki et al. 2010). Although Burt (2014) and Pentland (2014) do in fact acknowledge that social interactions and relationships form connections, they arguably overlook what Stark (2009) identifies as the action problem because of their relative emphasis on network ties and structures. Specifically, this alternative view proposed that social networks instead need to be recognised as culturally constituted evolutionary networks. For example, the relational sociology of Mische (2011) tries to resolve these theoretical tensions (Carrington and Scott 2011). This alternative arguably offers a more integrated approach to explain structure and social networks where individuals are more embedded: “Social relations are culturally constituted, and shared cultural meanings also shape social structure” (Pachucki et al. 2010, 219).

Patchucki et al. (2015) suggest that through relational sociology “Culture and social networks can be usefully seen as mutually constitutive and coevolving… having grown from common sociological roots in relational thinking” (Pachucki et al. 2010, 219). Both Mische (2011) and Stark (2009), hence, advocate the use of network analysis. Through the notion of agency, this type of analysis allows us to understand these tensions, frictions and dilemmas as productive, creative and therefore entrepreneurial, which in turn may be organised and harnessed through innovation systems. And so, rather than understanding social structures that combine to form as independent phenomena, as with Burt (2009, 2014) and Pentland (2014), understanding brokers as participants within constituted interplay, formalised relationships and ties may be operationalised and therefore measured (Pachucki et al. 2010, 218). It is fair to say that this debate has not yet been resolved.

Burt (2014), for example, treats Stark and Vedres’ (2010) intersection as a connection point rather than an embedded and more complex network of ties, which have become familiar. Indeed, although Burt notes that reinforcement is noteworthy, he suggests that, on average, structural folds may be most relevant when selecting targets for brokerage (Burt 2014). This may be true to a degree regarding the design of policy interventions, but empirical data and subsequent analysis using concurrency
discourse analysis is more suggestive that when ideas overlap and recombine, new knowledge is generated (Start and Vedres 2010). In the paradigm of open innovation, compared with the absorptive capacity of large organisations, SMEs in particular struggle to engage external (in the case of this study, cross-sectorial) knowledge (Bakhshi 2013, 11). Within the context of the research to be presented here, the role of the broker may be perceived as indeed multi-faceted. On the one hand, the Intervention Scheme is a set of reinforced structures that can be explained through Burt (2009, 2014). On the other hand, in this study, the network thinking presented through Stark (2009, 2010) unveils that brokerage is indeed a recombination of both structures (the Intervention Scheme) and actors (the Intervention Scheme mentors) who, through discursive processes, nurture the familiar ties necessary for measuring the evolution of entrepreneurship, innovation and cross-sector collaboration projects.

2.3.3 Interventions and innovation

Therefore, arguably, for SMEs and seedling projects, the rapid identification of failure is just as important for the quick redeployment or cancellation of resources that are scarce or of critical importance. This is especially relevant for creative media and the digital creative industries. As value networks and open innovation engage crowdsourcing technology – for example, online intermediaries, who orchestrate challenge-driven competitions to generate new or leverage stagnant innovation IP – there are intriguing implications going beyond traditional geographic clusters of skills. As Cunningham (2013) suggests, “distinctions between consumption and production, labour and citizenship have blurred” (Cunningham 2013, 137). But when considered through open-innovation discourse, the problem of access to value networks, however blurred, is not the issue (Stark 2009).

The idea of having a single organisation as the node for integration, openness and interdisciplinary skills is beginning to erode, suggesting a post-organisational or post-managerial future (Ollila and Elmquist 2011). R&D systems at the firm, organisational and policy levels, which in a closed innovation system are siloed vertically, are also opening towards broader horizontal value networks. As with technological change, systems that (seek to) enter the value network must be able to interact and collaborate with other systems. With less interdisciplinary and thus interoperable skills comes higher risk in organisational systems and with it a lower chance of success; the more interoperability, the easier it is to integrate, but vertical
integration has less value. Interoperability is a term commonly used for technology systems, for example, *the interoperability of Web 2.0 technology and connectivity is an enabler of social media*. This thesis aims to develop the term through systems and network theory to measure the innovation value network. The investigation of interoperability will contribute to evaluation frameworks, advance thinking about innovation sustainability in the creative industries at the firm level, and build on the successes of demand-driven creative industries initiatives and research into this subject (Cunningham, Cutler, Hearn, Ryan and Keane 2004; Cutler 2003).

There is evidence that organisational and institutional processes are shifting towards open innovation and that the collaboration of heterogeneous actors is no longer adequately managed hierarchically by a single organisation. As network theory suggests, innovation systems are moving towards heterarchies located across multiple organisations and networks (Bogers and West 2012; Stark 2009). The dynamisms of change surrounding collaboration and technology deepen and entrench further complexity and displacement within clusters and nodes in these networks. Understanding the nature of change and the forces that go beyond the economic, to the interoperability of the social and cultural, is therefore fundamental to the challenges that organisational interdependence research seeks to help resolve.

Because of the growing complexity of innovation in the knowledge-based economy, there is an increasing degree of specialization and interdependence among firms and institutions. This interdependence forces greater cooperation among firms and research centers located within geographically based clusters (Nada 2010, 63).

The role of intermediaries is also pertinent to the creative industries and its ability to facilitate interaction with other sectors. Potts (2012) argues that the intermediary role as enabler of other industries affects not only all phases of the innovation process, but also an overall creative economy. As such, the creative economy is viewed as integrated with all sectors, rather than a sector that operates independently (Rooney, Hearn, and Kastelle 2012). Without so-called *embedded creative interoperability*, companies struggle to engage the knowledge provided by the creative industries (Swan and Hearn 2014a). Australian creative industries research, for instance, has shown that networked digital technology and digital services embedded across all sectors is increasing, with the highest number of
embedded creative occupations notably digital content and software (Higgs, Cunningham and Bakhshi 2008). That is, that embedded creatives have a role as enablers of innovation and entrepreneurship in other industries (Hearn, Swan and Bridgstock 2012).

This brings the review of literature full circle to the focus on the intersection between technology management and the creative-media sector. The Intervention Scheme, as an action-research project, sought to contribute to the Australian national economy and entrepreneurship by enhancing the skills of SMEs. Specifically, the focus of the analysis in this research is on the role of the Intervention Scheme as intermediary between digital-media creatives (representing the creative industries) and other industry sectors, being education, mining and manufacturing. Cunningham (2013) emphasises the importance of such mechanisms for the creative economy. In particular, he details the preceding public interventions, which provide a context for the Intervention Scheme of this study.

The Intervention Scheme was partly inspired by a series of policy initiatives that connect small-business sectors with the creative sector (Cunningham 2013). The analysis of this very narrow and targeted policy initiative supports the view that small business is broadly absent from government policy, not only in Australia, but also, as Cunningham (2013) suggests, in the UK and New Zealand. However, some demand-driven initiatives that connect the creative sector with demand for its services in the wider economy have had success bringing creative industries and innovation policy together. These challenge traditional approaches of policy makers with the adoption of atypical and less generic interventions, which, in business-as-usual terms, are deemed non-applicable to small/creative enterprise. Cunningham (2013) notably points towards the key literature of NESTA24 publications that have had success not only in supporting the definition for tailored policy designs, but also in building a body of empirical data to support a program of experimental policy schemes, which partly inspired this study’s Intervention Scheme (Bakhshi 2009, 2013; Cunningham 2013). More broadly, such intervention policy experiments endeavour to reveal the dynamics between cultural and economic value; these

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dynamics are among the central issues of innovation itself, and indeed, are a core concern of this thesis.

Cunningham (2013) describes the lineage of this program of policy initiatives among the experiments and case examinations. Among these is Bakhshi’s (2013), Creative credits: a randomized controlled industrial policy experiment, in which he begins with linkages between creativity, open innovation and SME performance, as the basis for the innovation voucher scheme. Bakhshi (2013, 11) noted that “open innovation poses particular challenges for SMEs because of their lack of capacity to both seek and absorb external knowledge when compared with larger firms”; however, he also presents evidence that this field is still growing, and that SMEs should be no less able than larger firms to leverage open innovation, albeit while facing different dynamics. In the creative-credits intervention, six months after the policy experiment, participants were “significantly more likely to have introduced product and process innovations” than non-participants (Bakhshi 2013, 31). Critically, the report also noted that an even more important outcome of the policy experiment was the method evaluating the effectiveness of the policy mechanism, which has previously been lacking (Bakhshi 2013, 36). However, it is also significant that these methods were hard to replicate beyond six months after completion of the intervention because after twelve months neither significant growth nor evidence of network impact was apparent (Bakhshi 2013, 25). One possible explanation Bakhshi (2013) suggests is that in some cases, NESTA missed opportunities to offer brokerage between creative groups and their SME partners. The critical question that arises from this data-rich scheme is, as Cunningham (2013, 127) puts it: “Would this accelerate their ability to develop new products, new services and new markets?” – the answers would be a mild yes”. Bakhshi (2009) highlights Schumpeter’s distinction between invention and innovation, where the former does not necessarily lead to the latter; in other words, the linkage between the two is not guaranteed if (socioeconomic) value is not recognised.

Although surmised in policy discourse (e.g., Cunningham 2013; Hearn and Rooney 2008), there remains little evidence at the firm level about the question of how the creative industries create sustainable value in other industries, despite the fact that open innovation theory (Chesborough 2006) would also suggest this may be possible. Although these policy experiments above have had successes, in Australia,
policy frameworks, and by implication, the resultant dynamics of industry systems, have largely ignored this question in the context of small enterprise, which incidentally the creative industries tend to be (Cunningham 2013). Critically, also overlooked in policy has been how open innovation has perpetuated a discourse of openness in parallel with the embedded and ubiquitous global-facilitation platform of the internet and associated creative enterprises.

Cunningham (2013, 137) argues for mechanisms that unlock the content and communication crucial for innovation systems:

This includes lowered costs, including transaction costs, to pre-existing content locked up in legacy formats and content management systems, or sequestered by copyright regimes skewed toward powerful aggregators rather than creators, or stored in ‘silos’ because of a lack of interoperability between data and metadata systems.

On the surface, this appears to be a technical domain, but it is causal of a wider range of issues for both technology management and the creative-media sector. There is much work that examines data interoperability between systems; however, Pagano (2011) argues that it has been misunderstood by realms of technology management, and calls for more understanding of the interoperability between systems or products, which, as this thesis examines, may also be applied to creative enterprise. The issue, however, is not restricted to simply data and metadata systems, but as Pagano (2011) proposed, scenarios that resonate with entrepreneurship. To understand interoperability purely as a technical issue of conformity and standardisation is incorrect for two reasons. First, such a narrowing of capabilities more broadly inhibits the knowledge exchanges of collaborating systems (Pagano 2011). Second, technical interactions are subject to the same dynamics of change that apply to industry (Cunningham 2013). Different systems, whether creative or technical must be able to exchange information to generate knowledge; through analysis of the creative industries and its role in collaboration, this thesis argues that innovation may also target applied aesthetics and processes (such as emerging business models, rather than the product or service itself).

In explaining this creative collaboration, a key theoretical focus is “the network property of a cohesive group whose membership overlaps with another cohesive group”, to structurally fold (Vaan, Stark and Vedres 2014, 1). In building on the
work of Vedres and Stark (2010), Vaan et al. (2014) collaborates with the authors in attempting to develop a topology of creativity in asking this question: “What accounts for creative success when the unit of innovation is a team?” (Vaan et al. 2014, 1). In developing a cultural network analysis, Vaan et al. (2014) advance the notion of structural folds towards high-performance creative success in game-changing innovations. In particular, the study opens up methodological constraints surrounding assumptions that cohesive groups were mutually exclusive (Vaan et al. 2014). These conditions are inclusive of group capabilities available at the firm level to interact, function, or in other words, interoperate, with others to produce not only novel, but also critically acclaimed products. When viewing through the capabilities and resources available to small enterprise, critical acuteness for selection of early adoption of ideas is heightened, often in contraction to logical norms adopted by government and large enterprise. It is here that the linkages between interoperability and innovation are made, and through these linkages, the conception of creative interoperability devised.

The relevance of structural folding and recombining of capabilities, at many levels, and the generation of new knowledge, with regard to innovation and innovation management at the firm level, is the core issue of this thesis. Recombination is driven by Schumpeter’s (1942) constant destruction description of disruptive cycles, which constantly challenge all frameworks, whether regulatory, technological or entrepreneurial. That these cycles are demand-driven, as the link between creative industries and innovation infers, then logically we may infer that in evolving towards culture (Cunningham 2013), innovation may be seen as situated as a process of collaborative democratisation, as opposed to one solely left to market forces. Similar to the overwhelming evidence that open innovation provokes large companies to re-think how to innovate, so policy makers need to be early adopters of innovation and provide markets for new ideas. This in turn calls for new concepts, such as creative interoperability, to guide, understand and evaluate innovation by cross-sector collaboration.

The literature review supports investigations into the research problem of measuring open innovation forms in SMEs (van de Vrande et al. 2009). Bound to this is literature surrounding the motivation of actors within value networks and the nature of the innovation-creation process. Explored through inquiry into these
processes are also contentions that much innovation is hidden, and when combined with organisational interdependency and geo-clusters, the framework for twenty-first-century industrial innovation is situated, organised and distributed very differently than in centuries before (Freeman 1995; Freeman and Soete 1997; Stark 2009; Stoneman 2010, 2011; Vedres and Stark 2010). The thesis seeks to contribute to this debate.
Chapter 3: Methodology

3.1 BACKGROUND

This thesis is situated in the intersection of creative industries and innovation studies. The study was closely aligned with, and embedded within, a two-year industry development project funded by the Australian Government. The aim of this Intervention Scheme was to research, model and showcase strategies for integrating creative media expertise across non-entertainment industry sectors. In particular, the Intervention Scheme aimed to facilitate the development of three demonstrator projects in which creative media companies worked with organisations in other sectors (e.g. education, mining and manufacturing) to bring about process or product or service innovation in those sectors. The remit of the Intervention Scheme project was to create a set of tools that could nurture effective and mutually beneficial collaboration between traditional business organisations and small innovative businesses from the creative-media industry. The three demonstrator projects were also meant to form the basis of the case studies to invent and test a framework to evaluate the overall successes and failure of such innovations and apply this to the Intervention Scheme. The demonstrator projects also provided training opportunities for a number of interns, though this aspect of the intervention and its subsequent evaluation are not treated further in this thesis.

To reiterate, due to commercial-in-confidence, intellectual property and ethical requirements, this study has required a high level of anonymisation. This has created a limitation on providing some descriptive detail. Specifically, the names of all participants, organisations and projects, including the Intervention Scheme itself have been changed for the purposes of confidentiality and anonymity. The following eligibility requirements and selection criteria have been reproduced with permission from the Intervention Scheme.

3.2 INTERVENTION SCHEME HOST ELIGIBILITY AND SELECTION

Project participants were sought using two methods: leading Australian firms/organisations were invited by the Intervention Scheme through industry
relationship networks, and other interested parties could express their interest through publicly available websites. Each creative media company and host company was then reviewed, assessed and matched (or in some cases, discarded) by the Intervention Scheme Selection Committee. The committee consisted of the Intervention Scheme project director, key representatives from two universities and the mentors identified for each project. During the selection process, potential participants submitted three forms: Eligibility Requirements, Selection Criteria and Application. A shortlist was created based on the forms submitted and the final participants were selected after rigorous review by the selection committee.

In order to be selected for participation, host companies needed to demonstrate their compatibility with the eligibility requirements and selection criteria process. This was to ensure that host companies were appropriately equipped and resourced to take full advantage of a creative-media skills project. In addition, this helped to ensure that the project would have a positive long-term impact on the business. These requirements were formally documented in conjunction with an Expression of Interest document and more-detailed information was made available publicly for host companies that wanted to apply. These outline documents are available in Appendix A: Intervention Scheme Expression of Interest. Following the application, selection criteria for the host companies was followed. The outline of eligibility requirements and selection criteria documents are available in Appendix B: Eligibility Requirements and Selection Criteria. Once the selection committee decided on a shortlist for Intervention Scheme candidates, final selection involved one-to-one matching, which occurred through interviews and meetings of the host companies with the interactive media team for selection. The final mapping and selection of creative-media skills for each project integration (grouped by region) and the host industry sectors can be found in Table 3.2. In addition, as will be described shortly, several unsuccessful project proposals were selected as comparison cases that would not receive the intervention but would be asked to participate in tracking interviews. An amount of $75,000 of funding was allocated to each of the three interventions. Host companies were expected to contribute the same amount in cash, and/or in kind resources (see Appendix A and B).
3.2.1 Non-participant comparison group selection

It is important at the outset to be clear that, for the purposes of this study, non-participants were not deemed as formal control groups in the strictest sense because neither they (nor the intervention groups) were selected randomly. Random selection of control groups is of course the ideal experimental option in deductive research because it guarantees the control and experimental groups are identical except for the intervention. This is, however, rarely achieved in practice. The comparison groups in this study were selected from Intervention Scheme candidates rigorously shortlisted by the selection committee and do qualify as useful comparison groups because they were seeking assistance, as were the intervention groups. As well as being shortlisted, they were deemed similarly robust as the intervention groups, as is recommended by Hacket and Dilts (2004). That is, eligibility and selection of both intervention and comparison groups were in fact identical (see Appendix B: Eligibility Requirements and Selection Criteria) because they both succeeded in the shortlisting process of the selection committee. That is, comparison groups were recruited on the basis that they were eligible for the Intervention Scheme, but were not chosen because there were better pairings of host and creatives in terms of skills, location and industry sectors, as detailed in Table 3.2.

Hackett et al. (2004) draw on a wealth of literature reviewed for designing business-incubator policy programs and they identify such groups as a valid part of inductive research as qualitative informers. Hence, although this study acknowledges that selection was not completely random based on identical groups, comparative analysis was conducted grounded in selection based on the criteria of the next most-suitable. That is, selection was not based on picking winners versus losers; all were in essence viable candidates. Those selected were not those that needed help or could be helped by incubation; nor, even further as Hackett et al. (2004, 62) suggest, could they be described as “weak but promising”. Hence, non-participant results generated comparisons that do not prove causality of the Intervention Scheme; but rather, as qualitative informers, provide comparisons that yielded important insights (Storey et al. 2007).

25 It should be noted that comparison candidates were in fact limited in number; one comparison group consisted of an actual participant that was unable to continue with the Intervention Scheme, as detailed in later chapters.
One potential bias has not been possible to fully alleviate due to the scope of this study. The lack of true control groups limits the causal conclusions that are possible in relation to measurement of the prolonged longitudinal impact brought about by the Intervention Scheme. It is known that ex ante evaluation may be considered useful for such policy experiments when control groups are not possible (Todd and Wolpin 2006). However, this kind of econometric research was considered outside the disciplinary domain of this enquiry. Moreover, as Stark would suggest, groups that produce tangible outcomes are also highly likely to disperse even following demonstrably successful innovation (Stark 2009). This renders consideration of simple longitudinal outcomes quite problematic. Nevertheless, the research design of the Intervention Scheme itself was informed by, and contributes to, the body of literature concerning policy experiments on stimulating entrepreneurship in the creative industries (Bakhshi 2013). As such, this study will hopefully encourage further work that maps and charts trajectories beyond the closure of such programs, so that they may be reliably measured and understood as they evolve.

3.3 DESIGN OF THE INTERVENTION AND EVALUATION

3.3.1 An overarching comparative case study approach

The intervention and its evaluation used a comparative case study approach. Longitudinal descriptions of intervention projects were developed using up to four waves of interviews and other public evidence sources over the six-month period that the intervention projects ran. Non-participant comparative case studies of projects that applied for, but did not receive Intervention Scheme funding, were also developed over the same period, using pre-test and post-test interviews. This comparative case study approach allowed robust comparative assessment of key performance measures, which were required by the funders of the Intervention Scheme.

3.3.2 A participatory learning approach

The Intervention Scheme Team managed the intervention and evaluation using a continuous, mutual learning and action-oriented process between project sponsor,
project team, advisory group, project participants and other stakeholders over a two-year period.

As per the project documentation, 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 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 of diverse stakeholders into account (project documentation available from author).

Put another way, the project involved live case studies rather than retrospective ones. As this study was concerned with both understanding and developing an analytical framework, and imbedding this in an industry, the reflective and self-reflective cycles of action and enquiry enabled the author to fully explore and observe reflexively throughout. Theoretical development was similarly inductive, enabling the author to theorise the process of innovation.

3.3.3 Multiple sources of data

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

- Formal semi-structured in-depth interviews: These were conducted with participants, key stakeholders (management, coordinators) and business mentors.

- Documentation: Data included documents submitted through the Intervention Scheme (together with public records, annual reports, proposals, promotional materials, internal memos/documents, press releases).

- Informal observation: The author attended a number of Intervention Scheme events (e.g. workshops, showcases).
3.3.4 Interview guide

Semi-structured questions spanned six key areas:

- business models
- dynamics of the cross-industry sector
- origins of linkages
- interactive media and organisational implications
- innovation
- skills, human resources and human capital.

3.3.5 Interview schedule

Interviews were conducted for the Intervention Scheme as follows:

- pre-test interview: conducted 2–6 weeks after the intervention project commenced but prior to the main brokerage aspects
- mid-term interview: conducted at approximately 3–4 months
- post-test interview: conducted on completion of either the project or following the 6-month term
- follow-up interviews.

Interviews were conducted with:

- host businesses in three states (Region 1, 2 and 3)
- creative interactive-media teams in three states (Region 1, 2 and 3)
- non-participant control-group host firms and creative firms in three states (Region 1, 2 and 3).

In each case, the interview was conducted with the business or unit leader, the Intervention Scheme project leads, or both in some cases. Mentors for each of the interventions were interviewed at post-test stages and they also contributed informal observations throughout the project. Approximately six months after the Intervention Scheme was completed, all participants, including the mentors, were contacted and invited to respond to survey questions regarding the status of their business and the outcome of the Intervention Scheme.
3.3.6 Comparative case design

The comparative case design is depicted in Tables 3.1 and 3.2.

Table 3.1

*Intervention Scheme participant groups*

<table>
<thead>
<tr>
<th>Intervention Scheme</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intervention/Participant Firm</strong></td>
<td>Regional University/NeuroSmart</td>
<td>Edumedia/East Digital Games</td>
<td>Pioneering Mining Innovations</td>
</tr>
<tr>
<td>Participant Type</td>
<td>Host</td>
<td>Creative</td>
<td>Host</td>
</tr>
<tr>
<td>Sector</td>
<td>Education</td>
<td>Education/Gaming</td>
<td>Mining (services)</td>
</tr>
<tr>
<td>Product/Service</td>
<td>Product</td>
<td>Service</td>
<td>Service</td>
</tr>
<tr>
<td>Size</td>
<td>Large/SME</td>
<td>Micro</td>
<td>SME</td>
</tr>
<tr>
<td>Digital Media Skills</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

Table 3.1 above details all participants firms of the Intervention Scheme, and which firms were grouped together. Table 3.2 below provides a similar overview of non-participant comparison groups. What is noteworthy for the comparative case design here however is that no intervention occurred linking host and creative groups by region.
Table 3.2

*Intervention Scheme non-participant groups*

<table>
<thead>
<tr>
<th>Intervention Scheme</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-participant Firm</td>
<td>Aspiration Software</td>
<td>Aspiration Software/ East Digital Games*</td>
<td>State Museum</td>
</tr>
<tr>
<td>Non-participant Type</td>
<td>Host</td>
<td>Host</td>
<td>Host</td>
</tr>
<tr>
<td>Sector</td>
<td>Gaming</td>
<td>Gaming</td>
<td>Museum</td>
</tr>
<tr>
<td>Product/Service</td>
<td>Product</td>
<td>Product</td>
<td>Service</td>
</tr>
<tr>
<td>Size</td>
<td>Micro</td>
<td>Micro</td>
<td>SME</td>
</tr>
<tr>
<td>Digital Media Skills</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
</tbody>
</table>

### 3.3.7 Ethical Considerations

Based on the methodology outlined, this project required a low-level ethical assessment and was approved, inclusive of variations, by the QUT Human Research Ethics Committee (approval number 1100001440).

The action-research component gathered data from the three case-study participant firms and mentors within the Intervention Scheme, and from the selected non-participant firms that had applied for the Intervention Scheme but were not chosen to participate.

The case studies involved interviews that intervention project participants agreed to and approved prior to meeting, and as such, did review and agree to the use of data that included the guidelines of the QUT Ethical Clearance form. With regards to the primary data collection tools (interviews, questionnaires, observation groups), the relevant people, committees, authorities and stakeholders were consulted, and principles guiding the study were agreed on before action was taken.

To reiterate, in part due to ethical requirements, this study was required to have a high level of anonymisation. Specifically, the names of all participants, organisations and projects, including the Intervention Scheme itself, have been changed for the purposes of confidentiality and anonymity. Any pseudonyms used to stand in for the original names are intended to be fictional and do not relate to the
true participant, organisation or project name. It may be conceivable that a fictional name used may relate to a real person or entity; however, this should be deemed coincidental and that person/entity should not be considered to be related to this study.

3.4 BUILDING THEORY FROM THE INTERVIEWS

After the evaluation was completed and reported to the funders and other stakeholders, the information collected in the interviews was then subject to post-hoc abductive analysis to theorise the results obtained in the field experiment. Simple inductive qualitative analysis had assisted the evaluation phase, but qualitative analysis software was also used to address several specific needs: to further develop theoretical findings and the complexity of the research design, and to satisfy the desire for reliability in the data analysis and the emphasis in grounded theory on systematic coding for validity (Charmaz 2006). Initially, we examined NVivo,26 which proved useful for data document management and transcription; however, we found Leximancer a more useful tool to analyse documents towards visualising patterns, themes and common concepts between groups. Interview data was analysed from each of the Intervention Scheme projects (hosts, creatives and mentors) and comparison groups (hosts and creatives only) using computer-aided qualitative discourse-analysis software (CAQDAS) (Rooney 2005).

The case study analyses (in Chapter 4 and Chapter 5) produced rich and detailed descriptions of both the outputs of the Intervention Scheme, together with a descriptions of comparison group non-participants that were not involved in the Intervention Scheme. Through this analysis emerged the beginnings of the constructs necessary for theory building. However, in constructing grounded theory, it is important to limit bias associated with qualitative research and preconceived notions that can develop when the researcher is an insider observer (Charmaz 2006). Hence, analysis of the collaborative process during and after the Intervention Scheme made use of open and axial coding appropriate to grounded theory and abductive reasoning

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26 The nature of action research is for the researcher to fully absorb qualitative data. Leximancer, after a review of the data collected in many software products, yielded results that alleviated the intensity and allowed for less researcher-bias and more-objective outcomes. Refer to Chapters 6, 7 and 8 for more information regarding the CAQDAS selection criteria. For commercial information on NVivo refer to: http://www.qsrinternational.com/
for discovery (Charmaz 2006, Reichertz 2010). For this size of project, research resources, scope and time available, electronic data coding was employed alongside manual qualitative analysis (Roen 2007). Chapter 4 and Chapter 5 employ a grounded strategy of inductive coding and thick descriptions, as proposed by Glaser and Strauss (1967). This strategy serves to inform the coding of subsequent electronic collected data (interview transcripts) in Chapter 6, and, in particular, to help analyse the evolution of projects in Chapter 7 (Intezari, Pauleen and Rooney 2014). In order to let further generality emerge, qualitative text-analysis software tools for analysing data, such as Nvivo (for open coding) and Leximancer (for axial coding), were used. Leximancer proved effective in the axial-coding stages for discourse analysis, as described by Flick (2009), for instance, in visualising coherent clusters of relationships between related codes of concepts and themes. Many of these software tools originated and are widely used in research throughout Australia; in this study, they provided the author with useful insights, in addition to further advancing discourse analysis as a coherent and genuine methodology (Flick 2009).

Significant time was invested exploring other qualitative software and attending training workshops, which also included Nvivo and Discursis. Software was eliminated due to its inability to adequately interrogate data gathered and manage data complexity. In the case of Nvivo, although it was useful for converting verbatim transcripts into meaningful content, the study did not have enough resources to invest in the manual coding that the software required (i.e. the limitations of a single researcher would have likely led to a bias when coding). Equally as important, in the case of Discursis, was that its usual research design did not match the comparative research design. Specifically, Discursis provides useful temporal visualisations between interviewer and interviewee. Although the results were positive in measuring these interactions, measuring the corpus of concerns between groups provided a more insightful analysis than between the researcher and groups. Because Discursis uses much of the Leximancer software engine, these results provided useful indicators in developing innovative temporal network-analysis methods that were particularly fruitful, as detailed in Chapter 7.

27 NVivo, Leximancer and Discursis are all currently Australian software products.
Thus the study departs from conventional \textit{quantitative} network analysis that measures constructs such as K-cliques at the point of structural holes or folds (Stark and Vedres 2010). Instead, this qualitative approach is particularly appropriate because the Intervention Scheme participants, in social-network analysis terms, form a \textit{small network}, and therefore may be manually coded, allowing for the thematic coding of qualitative constructs consistent with a grounded-theory approach (Charmaz 2006).

In effect, both the cases studies and the theory building phases constitute an overarching \textit{grounded theory} research program. As Rooney (2005, 409–410) explains, Leximancer also learns in a grounded fashion what the main concepts in a corpus are and how they relate to each other. Content analysis can be done as either conceptual (thematic) analysis or relational (semantic) analysis. Leximancer does both, identifying concepts in the corpus and how they interrelate. In identifying concepts and showing how they interrelate, Leximancer uses word frequency and co-occurrence counts as it basic data. Leximancer builds its analysis by using the frequency data and data about the co-occurrence of concepts to produce a concept co-occurrence matrix. Once a concept has been identified Leximancer then builds a thesaurus of words that are closely related to the concept thus giving the concept its semantic or definitional content…The investigator can also drill down through a concept, into its thesaurus of words, and then directly into the chunks of text where those concepts and words are found. This allows the investigator to easily interrogate the text and interpret it in light of his or her own reading of the corpus and to apply various linguistic analytical techniques such as discourse analysis.

In particular, Leximancer was used to analyse documents and visualise patterns, themes and common concepts between groups. Leximancer is thus a quantitative tool to be used interpretively, producing stable and reproducible semantic visualisations of complex text data (Hine and Carson 2007; Rooney 2005) to support the theory-building process. In this way, the researcher interrogates the data iteratively, building theoretical models and \textit{testing} them against the data constraints encoded in the verbatim transcripts of the respondents. Leximancer was used to create the maps discussed in Chapters 6 and 7, which are visualisations of the
discourses and knowledge exchanges (i.e. the semantic networks) between and within various groupings of the companies.

Moreover, according to Rooney (2005), the centrality of network connections indicates shared language and is a useful measure when analysing group semantic similarity. Areas of mutual understanding and agreement are thus visualised by clustering between groups, while displaced group distance represents a degree of specialisation (Dodgson and Gann 2010). These types of visualisations and patterns are the basis of the analytic approach used here to deduce meaning from the network maps. In other words, we used Leximancer in part to map interview data, and this data helped us to iteratively develop a theoretical model (Ramos and Ford 2011) for how network actors interoperate in the co-creative system of the Intervention Scheme.

In the pursuit of theory, the need to constrain the potential bias of the researcher is important. Leximancer uses quantitative language recurrence to test possible constructs the researcher may suggest (Angus, Smith, and Wiles 2012; Angus et al. 2012; Smith and Humphreys 2006). For instance, the organisation of the companies in the Intervention Scheme was based on their geographic location, which reflected the regional nature of the funding bodies involved. This bias, however, initially dissuaded comparisons of non-geographic linkages. Leximancer is not constrained in what can be compared. The relationship between participant groups and non-participant (control) groups is complex. Therefore by using Leximancer, comparative discourses and the supporting of any hypotheses may be explored based on empirical ties and group relationships. That is, patterns can emerge across comparisons, constructing relationships that may not have otherwise been revealed (D. Hine and Carson 2007; Rooney et al. 2010). Leximancer again serves this purpose because most graph theory and social-network analysis methods do not include real-value linkages. Leximancer, however, can include both directions of an asymmetrical link to discover indirect relationships between concepts and the measure of concept connectedness adds a hierarchy to the network (Smith 2006). Hence, Leximancer allowed the logic of theory building to include the pursuit of indirect and intangible links that form between tacit and discursive knowledge.

In concept mapping using data-mining techniques we follow the processes of computer-assisted text analysis of Hine (D. Hine and Carson 2007) and Rooney...
We were hence able to develop a systematic method extensible for comparative analysis between groups and their semantic alignment to abduct theory. We use the term *creative interoperability* to describe the operations between two groups, one creative team with one host company, under the guidance of a mentor. We view the intervention as an artificial system and site for analysis to understand the creative interoperability between two groups that produced innovation outcomes. Our initial comparative case-study design (see Chapter 6), allowed for comparison of Intervention Scheme data between 1) host and creative participants (*participant comparison*), 2) participant host and non-participant (control) host (*host comparison*); and 3) participant creative with non-participant (control) creative (*creative comparison*) (Hearn, Swan and Bridgstock 2012). Chapter 7 did not require Leximancer analysis of non-participant data, so the comparison instead was for each intervention (Region 1: Education; Region 2: Mining; and Region 3: Manufacturing) during the pre-, mid- and post-test Intervention Scheme phases. In all cases, interview data was analysed from each of the three participants (hosts, creatives and mentors) and non-participant (control) groups (hosts and creatives only) using Leximancer as in Rooney (2005). Case studies were defined as three separate interventions, described in this chapter as the education intervention, the mining intervention and the manufacturing intervention, each containing different organisational participants in the roles of host, creative and mentor. Each intervention project was also initially assumed a comparative control-group host and creative according to geography/funding zones. Although it is useful for evaluation and initial case-study analysis to acknowledge the physical linkages between participant groups, non-geographical connections outside the realm of the scheme may not have been fully explored if focused by region, a bias Leximancer was able to help alleviate.

This then concludes the Methodology section of this thesis. Qualitative explanations in Chapter 4 and Chapter 5 inductively provide the notion of Creative Interoperability through thick descriptions of the empirical evidence occurrences. These pursuits informed theory building in Chapter 6 and Chapter 7 through abductive reasoning. Abductive interpretation in qualitative analysis presented the most logical method as “the process of associating data with ideas”, and thus, extends the literature surrounding innovation and collaboration (Lipscomb 2012,
251). The process of constructing the corpus of associated data, through the scrutiny and interpretation of observed data, presented co-occurrence concepts and themes for theory building, which were used to construct new hypotheses to explain what happened (Charmaz 2006, Flick 2009, Reichertz 2010). The abductive method is further strengthened by the use of electronic data coding and empirical visual social-network maps that are reproducible through computer-aided qualitative discourse-analysis software (CAQDAS).
Chapter 4: Creative digital services in education, mining and manufacturing: Pursuing innovation through interoperability

This chapter was co-authored by Dan Swan and Greg Hearn and was published as a chapter in the book Creative Work Outside the Creative Industries: Innovation, Employment and Education (Swan and Hearn 2014a). It provides an introductory overview of the three cases in which the intervention occurred, as well as an explanation of the rationale for the Intervention Scheme, and a summary of the main evaluation outcomes. The findings of this chapter are critically analysed to understand how creative digital services interoperate with other industries outside of creative industry sectors. Detailed comparative analysis of participants and non-participants is provided in Chapter 5. In accordance with a Thesis by Publication, this chapter has been reproduced from the original book publication except that in response to the examination process, the version of the chapter reported here refers to “comparison groups” rather than “control groups”. Otherwise it is identical to the published version. There may be unavoidable repetition of terms, abbreviations together with formatting inconsistencies such as citation variations. This chapter also uses American English spelling instead of Australian English due to the requirements of the book.

28 The research described in this paper was funded by the Australian and Victorian Government.
Due to copyright restrictions, this published book chapter is not available here. For further information, please view the publisher's website at:

http://www.e-elgar.com/shop/creative-work-beyond-the-creative-industries?___website=us_warehouse
Chapter 5: Detailed outcomes of the comparative case analysis

Chapter 4 described the three case studies and linked the outcomes of the Intervention Scheme with open innovation. Examination of this relationship surmised that, without the brokerage of the Intervention Scheme, sectors seeking to embed external knowledge struggled to engage with creative firms. Specifically, the role of shared language was identified as a significant attribute that enabled creative outcomes of value to be brokered and produced.

The aim of Chapter 5 is to provide a more detailed description of the three intervention cases across all phases of the intervention and of the comparison cases, at pre- and post-intervention stages. In addition, the outcomes of the intervention and comparison cases are evaluated against the scheme’s performance criteria. It is noted that because the comparison cases are not true control groups, definitive statements about causality can not be made. However, for the purposes of this thesis, this chapter suggests that the intervention, which is theorised in Chapters 6 and 7, did have significant real-world commercial outcomes that can be partly attributed to the Intervention Scheme. This highlights the significance of the research opportunity in this thesis, in observing a large well-funded real-world quasi-experiment that ran (in total) for two years. It also describes the innovation processes and their effects, which are theorised in novel ways in Chapters 6 and 7. This chapter has not been published as a paper, but draws on a section of the formal evaluation report for the Intervention Scheme and was solely authored by the candidate.

5.1 INTRODUCTION

To reiterate from Chapter 3, Figure 5.1 provides a guide to the phases in which the Intervention Scheme proved to be most effective and depicts the interview points.
The phases of discovery, incubation and acceleration (D-I-A) were adopted as an evaluation model provided initially through Lindegaard (2010) using open innovation methods. With this in mind, the current chapter describes each of the three Intervention Scheme cases up to the end of the incubation phase. This chapter also provides a detailed comparative analysis for the intervention cases and the non-participating cases.

5.2 INTERVENTION 1: EDUCATION

Edumedia, an educational digital services company, was selected as part of the Region 1 (education intervention) digital creative team. It is worth noting that, originally, an additional digital creative team, East Digital Games, was selected to work alongside Edumedia from the outset. When it applied for the Intervention

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37 The D-I-A model was originally developed by the Radical Innovation Group and Rensselaer Polytechnic Institute in Leifer (2000), and has continued to be refined as an industry practice in Arteaga (2013), referenced in Chapter 7. For more information see http://www.rinnovationgroup.com/resources/academic-research

38 A change of circumstances with the personnel at East Digital Games meant that they did not have the dedicated resources to work on the Intervention Scheme project full-time. As much of the early stage phases had been surrounding discovery (that is, problem definition and scoping), the impact of their withdrawal from the project was minimal. East Digital Games contributed to the initial pre-test stages as a creative participant of the evaluation, and because it was no longer directly involved with the Region 1 intervention project, the company later contributed with post-test stages as a non-participant creative group.
Scheme, Edumedia was focused on interactive face-to-face training materials online for education, not-for-profit and corporate clients. It helped clients to understand changes in existing technology to leverage and reach their audiences, using turnkey or *white-label* solutions, particularly for clients who wanted to use technology for remote training. Edumedia was a micro-business (fewer than five full-time or permanent staff) of three people and although the depth of individual experience was vast, the business was in its *start-up* phase of development. The Intervention Scheme presented the first opportunity for Edumedia to work in a collaborative partnership to bring creative-media skills to an organisation the size of the Intervention Scheme host business: the Regional University.

Through the Intervention Scheme, Edumedia’s objectives were to develop a proof-of-concept valued by the client, as well as to develop and maintain an ongoing relationship. The Intervention Scheme provided Edumedia with the opportunity to build a reputable brand name based on good work, from which they hoped to grow into an SME of 10–15 people. Through the Intervention Scheme, Edumedia were also able to engage with groups such as registered training organisations (RTOs), state police, the ABC, and other not-for-profit organisations, and therefore, to forge cross-industry relationships with organisations outside the digital-creative sector.

During the early stages of the project, the Intervention Scheme promoted a process of *discovery*, which was critical for defining the achievable outputs of the project and setting client expectations. The Intervention Scheme toolkit, mentoring and, most notably, project meetings that were also fed into online management platforms all proved useful cooperation and communication tools. *Speaking the client’s language* was an important aspect of Edumedia’s business practice, and this aligned well with the Intervention Scheme’s approach to the project, facilitating communication between technical and non-technical entities and vice versa. During the *discovery* stage, there were no organisational, structural or cultural barriers to Edumedia team members communicating with project people, allowing them to take an exploratory approach to defining project objectives. During these initial stages,

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39 The term *white-label* is often used for products or services that can be easily redesigned or rebranded for use by another company or organisation. This has been particularly successful in software development whereby companies use white-label products or services to avoid the costs of creating new technology or infrastructure.
the only barriers to communication were the demanding schedules of all those involved.

Without the Intervention Scheme, Edumedia predicted that working relationships would have been slower to form and to align with project deliverables. For the *discovery* phase, in particular, it was important that this included a formal process of relationship building with the external organisation, both inclusive and exclusive of the external organisation’s sector. The Intervention Scheme also helped Edumedia to take steps towards creating a prototype roadmap and broader innovation strategy similar to the Intervention Scheme’s own. The need for this assistance was attributed to the fact that Edumedia was a start-up micro-business with limited resources and it was unable to plan an innovation strategy while its processes were solely focused on the Intervention Scheme project deliverables.

Edumedia defined innovation as products or services that had not been created before, including features and adding value. Start-up companies are at their most innovative early in their evolution, when they are nimble and able to adapt readily to new environments. Edumedia embraced the opportunity to develop new ways to work with a much larger organisation with unfamiliar language and expectations.

For the Region 1 education intervention, Edumedia was matched with the Regional University Neuroscience Research Centre located in rural Australia (also a pilot catchment for the Australian Government’s NBN rollout\(^{40}\)). NeuroSmart relied on grants and public funding projects (such as the NBN). With Australian Government funding, the Regional University Research Centre had been trying to grow NeuroSmart’s online reach and, through the Intervention Scheme program, the Research Centre team had explored the commercialisation of NeuroSmart online. This transformation would rely on working with other industry groups (particularly creative-media teams). Hitherto, experience outside the Research Centre group was limited to external schools, and Research Services at the Regional University.

The target project for the Intervention Scheme was the Research Centre’s NeuroSmart research program, which had developed a product aimed at improving literacy and numeracy for underachieving school students. Through the Intervention

\(^{40}\) Australia’s National Broadband Network, see http://www.nbnco.com.au/
Scheme, the Regional University began by exploring NeuroSmart in the Home, a concept that brought its existing and successful skills programs (such as the ‘Flash Card’ kit) to parents or carers at home, using interactive media gaming techniques.

Only one element of NeuroSmart (numeracy) was developed with the Intervention Scheme, but the initial intent for the project in the longer term would be to extend to more programs (i.e. literacy). At an early stage of the Intervention project, the Regional University Research Centre was able to broaden NeuroSmart objectives beyond that which were initially proposed to the Intervention Scheme. Without the Intervention Scheme, the Research Centre would have had narrower goals, employed a consultant or relied on limited internal expertise, suppliers and networks. The Intervention Scheme catapulted the NeuroSmart vision into different areas (such as creative media) and provided a platform for communication and problem-solving, where teamwork and collaboration have bloomed. Collective meetings were exciting, connecting both the Research Centre and Regional University teams to creative-digital people and ideas, and taking their work into new fields. The Intervention Scheme 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.

NeuroSmart created more demand than the Research Centre and the Regional University could service. The Regional University saw the Intervention Scheme’s role as building the Research Centre’s capacity to innovate and cope with demand by leveraging the broadband connectivity of the NBN. NeuroSmart also maintained a huge database of qualitative and quantitative results gathered through institutional research measures. This included school surveys as a continual source of feedback (handwritten from NeuroSmart audience and customers; that is, teachers, parents and students) and NAPLAN (National Assessment Programs for Literacy and Numeracy)\textsuperscript{41} data.

Through the Intervention Scheme, the Research Centre identified the need to grow its capabilities and extend relationships in which the centre’s skills had been spread too thin. The Research Centre team has limited creative skills to develop

\hspace{1cm}^41\text{A national Australian test on school children in Years 3, 5, 7 and 9.}
NeuroSmart online and the skills gaps identified during the Intervention Scheme may help inform future staffing.

During these stages, Edumedia acknowledged that it had the necessary personnel and skills to achieve its goals during this very busy period of the incubation phase: Edumedia’s view was that it was small enough to react quickly and without internal conflict. Edumedia 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 inflexible structures, can inhibit project outcomes. This encouraged Edumedia to focus its work on bridging skills gaps, an approach it identified as relevant for the intervention. When confronted by inflexibility, Edumedia managed this by maintaining a nimble approach and repositioning the host project objectives when possible. This occurred during the discovery and incubation stages, which presented challenges surrounding expectations of what was possible to be delivered within the scope of the project.

During the initial stages of the discovery phase, Edumedia had to adapt quickly to the loss of partner East Digital Games, which presented additional skills gaps for project validation and the delivery of prototyping. During the incubation stages, Edumedia was 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 the Intervention Scheme and the University of Technology Sydney (UTS). While these unexpected management overheads were demanding for Edumedia, structural changes within the company (in terms of key personnel) during the intervention project were minimal. Edumedia’s nimble and lean approach was successful during the delivery layer – enabling them to scale delivery skills up or down when required.

A key challenge for Edumedia included maintaining resources to match the project demands alongside cash flow. Although the Intervention Scheme guaranteed funding, the additional contractual complexities added by the Regional University and the Intervention Scheme joining in a broader program of funding resulted in an

42 Technical and Further Education.
unanticipated mismatch of payment schedules. As a result, expenses to Edumedia (by the Regional University) were delayed, adding stress that was compounded when external contractors were critical to successful project deliverables. This experience provides an important lesson for institutions engaging micro-businesses, as delays in project funding can affect overall project deadlines. In this case, the Intervention Scheme provided sufficient mediation to limit the impact on the project and mitigated the strain on working relationships.

Progression from the discovery phase was complicated by a change of objectives, and hence, deliverables: from extending NeuroSmart online for children, to growing NeuroSmart online for adults. This change of focus was due to the Research Centre’s response to funding body demands and opportunities to extend NeuroSmart’s brief into a new area of adult education to assist unemployed jobseekers.

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

As a result of the Intervention Scheme, the Regional University and Research Centre realised the outcome of years of research: a faithful online translation of NeuroSmart. For the Regional University and Research Centre, the outcome they received as a result of the Intervention Scheme 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. Because of additional funding for a formal product in a national adult
Chapter 5: Detailed outcomes of the comparative case analysis

Chapter 5: Detailed outcomes of the comparative case analysis

In the numeracy learning setting, the Research Centre was expecting a planned launch of a minimal viable product (MVP) early 2014, 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. The Research Centre Directors were delighted to participate in the Intervention Scheme and were pleased with its outcomes: they have delivered the viable outcomes of the project (detailed functional specifications and proof-of-concepts that are testable), extended their research (including the reach of NeuroSmart into new sectors) and developed a formal product with national government support. Part of the processes learned through the Intervention Scheme will be carried through into all the stages of the program of development.

Through the Intervention Scheme, the Regional University and Research Centre increased their confidence that NeuroSmart would be faithfully translated online through creative media and into an MVP. 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 creative-media teams, but also the skills to articulate problems and solutions in non-technical terms within their educational expertise.

The Intervention Scheme exceeded expectations to the extent that now, through the Intervention Scheme and the integration of new techniques in game-play, the Regional University hopes to develop new tools to bring to the sector. Although it is too early to assess the next (acceleration) stage explicitly, it was expected that the relationship between the Regional University and Edumedia would continue deep into the next phases of the NeuroSmart program. In addition, both the Regional University and Research Centre have gained skills in confidently working with digital-creative and IT professionals. Edumedia has also learned key skills, managing projects with larger organisations, as well as developing the company around a successful case study that will help them to win new business. Both have achieved commercial outcomes, and the NeuroSmart product has revealed new commercial applications, such as education in the mining sector, and may indeed break away from the Regional University into its own commercial entity in future.
5.3 INTERVENTION 2: MINING

Viz Dat, the digital creative team for the Region 2 intervention project, focused on traditional industries that have problems sharing information (such as large data sets) with their clients. As a micro-business (fewer than five FTEs) Viz Dat offered fee-for-service tools and methodologies in data visualisation, overall user interface, user experience and content creation. During the Intervention Scheme pre-selection and discovery stages, the Viz Dat business proposition was somewhat broad and dominated by fee-for-service engagements. Its customers generally sought to expand the reach and accessibility of data, exploit existing data assets and add value. Viz Dat worked across multiple sectors, including television and entertainment, with some experience in the mining sector.

The Intervention Scheme helped Viz Dat to complete a project that involved large data-sets, and it was hoped that the Intervention Scheme project would function as a case study and model for future cross-industry projects. Viz Dat’s goals were to forge an ongoing relationship with Pioneering Mining Innovations, to develop a subscription-based business model with benchmarking data, and to build an ongoing relationship with the Intervention Scheme. Viz Dat’s future business goal was to create a spin-off company focusing on visualisation IP, and to further develop and expand the offering of its visualisation platform as a subscription model to cross multiple sectors. This was part of a strategy to move away from the limitations of fee-for-service work and diversify into product/platform IP to attract investment from big players such as Adobe, IBM or Microsoft.

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

A tangible example of the Intervention Scheme’s role in relationship building was its recommendation that both businesses seek legal advice on the IP brought to the project, the IP created through the Intervention Scheme and the IP that fell outside of these two groups. From an operational point of view, Pioneering Mining Innovations and Viz Dat wanted to tackle any potential problems of IP ownership, which both groups viewed as crucial, from the start. Viz Dat believed that the Intervention Scheme’s approach could become a tool or device in itself, helping small businesses to better commercialise. Viz Dat was also acutely aware of language issues inherent in visualisation as a method, which the Intervention Scheme identified as both an opportunity and a challenge. The Intervention Scheme mentors’ experience in innovation and commercialisation was integral to the discovery process and brokering a technical shared language that would eventuate into forming the business model of the joint venture between groups.

Pioneering Mining Innovations was the host business for the Region 2 intervention matched with Viz Dat. Pioneering Mining Innovations was a data-services company for the mining industry, specialising in providing insights into mining-equipment productivity, benchmarking and the analysis of people, performance and potential productivity. Among Pioneering Mining Innovations’ key differentiators was data reliability and in-depth chronological data analysis for value feasibility studies and evaluation plans. As an SME of around 15 FTEs, Pioneering Mining Innovations had limited capacity to innovate in-house. Pioneering Mining Innovations recognised that resources, knowledge and investment needed to be expanded. For example, IT expertise was confined to the singular but vital role of

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43 Discussion and negotiations about legal advice began between Viz Dat and Pioneering Mining Innovations in the form of a separate joint venture.
Chapter 5: Detailed outcomes of the comparative case analysis

database administration, and although passionate about innovation, the database administrator role was to focus on paid work rather than new development. Pioneering Mining Innovations’ annual growth projections for the next financial year were between 15–20%, a rate the company hoped would continue despite the view internally that the mining sector may have peaked. In addition to fiscal growth, a general goal for the Pioneering Mining Innovations business model was to balance business peaks and troughs.

Pioneering Mining Innovations defined success as achieving a deliverable and demonstrable product, not just a process. This success would help to open up Pioneering Mining Innovations’ services, improve efficiency, gain repeat business and maintain the value of the Pioneering Mining Innovations brand. Pioneering Mining Innovations had a specific business problem identified for the intervention project. It produced very detailed and precise paper-based reports to its mining sector clients. The quality and depth of these reports were beyond question, and helped their clients to increase productivity into billions of dollars. However, due to the detail and size of the reports, they were sometimes inaccessible and ineffective for communicating key learning 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 the Intervention Scheme was an interactive-media data-visualisation tool to enable users to transform data into concise and manageable reports in the form of visual graphics to disseminate information.

Pioneering Mining Innovations had previously engaged with other groups outside its industry to investigate possible approaches, such as business coaches, consultants, and more recently, Enterprise Connect, which introduced Pioneering Mining Innovations to the Intervention Scheme. An unknown challenge for Viz Dat was that Pioneering Mining Innovations had previously engaged with a possible solution – project ‘SquidInk’ – a back-end product to assist on-site supervisors with methodology. Pioneering Mining Innovations partnered with a mine and took the project to the prototype stage; however, the mine changed its processes and so abandoned the prototype, losing Pioneering Mining Innovations in excess of $100,000. 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 as well as in-depth creative
ideas. At the discovery stage, the Intervention Scheme encouraged Pioneering Mining Innovations to improve the structure of its decision-making process: this was a valuable step because, as a small business, Pioneering Mining Innovations tended to react according to demand. Without the Intervention Scheme, Pioneering Mining Innovations would have pursued the same project but would have outsourced the required work.

The Pioneering Mining Innovations CEO was responsible for strategy and was the key driver for connecting with the Intervention Scheme. Also supported by the Chief Operation Officer (COO), Pioneering Mining Innovations had a clear vision for its product, but was unsure how to get there, and based on previous experiences, wanted to build a relationship and partnership to overcome issues by consensus.

During the Intervention Scheme selection process, Pioneering Mining Innovations approved the selection of Viz Dat for more than its skills: the two companies were compatible in terms of size, ambition, culture and the desire to develop a long-term relationship. While Pioneering Mining Innovations was not afraid to take risks to innovate, the Intervention Scheme helped the company to engage in R&D with some degree of security. The established Pioneering Mining Innovations offering was based around innovation – providing knowledge through data services that companies did not have – and commodification of that business model had not been successfully explored. Although existing IT skills were expected to be enhanced through the Intervention Scheme, Pioneering Mining Innovations identified that it was prepared to hire new staff if needed. Cooperation between strategy and operations was something that Pioneering Mining Innovations sought to replicate through the Intervention Scheme collaboration, so the strategic roadmap with Viz Dat had to go beyond good communication and extend to deliverables.

For Viz Dat, the discovery phase caused no significant structural change to the organisation other than the joint-venture agreement with Pioneering Mining Innovations, and a realignment of the intervention project goals, IP ownership and licensing model. This enabled Viz Dat to develop alongside Pioneering Mining Innovations and validate the overall prototype approach and business model. Viz Dat
took its customised Agile model in combination with a \textit{lean development}\textsuperscript{44} approach to the customisation of its visualisation platform to suit the needs of Pioneering Mining Innovations (referenced to here as the Intervention Scheme prototype). This approach allowed Viz Dat to deliver iteratively, so that Pioneering Mining Innovations was able to test and assess in very specific stages. By setting these as deliverables alongside Intervention Scheme 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 the Intervention Scheme and the mentor from Biz Link (who helped to set expectations during the \textit{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 Pioneering Mining Innovations’ backend data. It allows deep analysis and data mining through visual tools and techniques. One of the unique challenges that Viz Dat was able to overcome was the notion of \textit{factoring}, which was a manual method that Pioneering Mining Innovations employed to validate data collection based on certain attributes and variables. By reproducing these assumptions within the visualisation tool, Viz Dat believed that its Intervention Scheme product provided a very clear solution to Pioneering Mining Innovations’ problem: providing added value to Pioneering Mining Innovations’ data and access to Pioneering Mining Innovations’ data sets. Solving the original problem of access to the data also revealed new, less tangible problems that were solved as Viz Dat developed new mathematical models. These models and algorithms could also have been developed in later project stages to help Pioneering Mining Innovations reduce elements of their operational overheads associated with data management.

Viz Dat was delighted with the Intervention Scheme outcomes: it achieved its goals of developing tangible IP and forming a long-term, joint venture with Pioneering Mining Innovations. Viz Dat saw the Intervention Scheme as a model for bringing two companies together through investment (or investors) that could be

\textsuperscript{44} Also known as \textit{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 \textit{churn}.
pursued by companies seeking to move beyond fee-for-service engagements in the future. As well as helping Pioneering Mining Innovations to roll out the visualisation tool, in part through MineExpo, Viz Dat had also been talking with other sectors and companies that may take up the tool. For example, through showcasing the Intervention Scheme work, Viz Dat hoped to work with an environmental engineering group to provide visualisation and modelling for weather data. The Intervention Scheme helped to stabilise Viz Dat’s business in two ways: by producing the tangible outcomes and through a rigid process of delivery that also helped to confirm the company’s direction towards development of an online product licence model.

Pioneering Mining Innovations’ business model underwent significant structural change as a result of the Intervention Scheme project. The discovery stages helped to move the business beyond a services and consultancy model to the creation of an entirely new business division: Pioneering Mining Data. In the initial stages, Pioneering Mining Innovations’ goal was to open up its services, but this evolved into significant organisational change with the creation of their Data division, the basis of the joint venture with Viz Dat. Through the iterative development process, Pioneering Mining Innovations’ understanding of Viz Dat’s solutions improved. As the Intervention Scheme outcome became much more apparent, so did broader possibilities, and Pioneering Mining Innovations recognised that the Intervention Scheme could give the company a framework and a platform for its whole product. Working very closely with the Intervention Scheme mentor, a licensing model was developed and then validated through an external consulting firm. Pioneering Mining Innovations’ new joint-venture division, Pioneering Mining Data, would continue to develop this data and toolset with Viz Dat. This would include licensing of the tools to provide revenue streams, supported initially through the consulting side of Pioneering Mining Innovations. As the tools developed and business grew, it was conceivable that Pioneering Mining Data would become the core business, and therefore, Pioneering Mining would become a more globally scalable company as a whole. International growth also meant that Pioneering Mining Innovations would

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45 MineExpo is a bi-annual World Fair for the mining industry. The upcoming exhibition in Las Vegas was seen as an opportunity to launch Pioneering Mining Innovations to an international audience, and hence, was a key motivator for developing a prototype through the Intervention Scheme.
gain expertise in gathering 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).

As they entered the accelerate phase, the next step for Pioneering Mining Innovations and the Intervention Scheme project was an official launch at the MineExpo event in Las Vegas. Viz Dat attended and provided support as a stakeholder in the new company in a combined effort to drive new users and sales to the joint venture product. Initially this launch consisted of both a public product and a private product – the latter was the recruitment of product champions who formed the user group for the next phase. Following MineExpo, Pioneering Mining Innovations were planning a road show in the US to showcase the Intervention Scheme product as part of a broader sales and marketing program of work. This would include on-site training and product support. It was hoped that the Intervention Scheme product would increase revenue up by AU$3 million over three years. During the incubation stages, Pioneering Mining Innovations talked with several leading blue-chip firms (e.g. Rio Tinto, Caterpillar) in the mining industry to validate its approach. It is a notable prediction that Pioneering Mining Innovations foresaw a downturn/slowdown in the mining sector, which it hoped may have an effect of increasing the demand for Pioneering Mining Innovations data services. The Intervention Scheme exceeded Pioneering Mining Innovations’ expectations, not only in providing a great product outcome, but also in building this into a commercialised product, which has been highly valuable. If the product were to be commercially proven in the future, Pioneering Mining Innovations anticipated hiring more workers to meet demand. In the meantime, it was relying on Viz Dat to provide the additional skills that may be required.

5.4 INTERVENTION 3: MANUFACTURING

Excel Media was the Region 3 intervention project’s creative partner and media-services company and it specialised in gaming, video production and digital media development. Excel Media’s model was to bring creative digital skills to non-industry sectors through consultancy and clear development methodologies and processes. Its goal through the Intervention Scheme was to provide a showcase to build a longer-term relationship and development program with its partner, Rotation
Chapter 5: Detailed outcomes of the comparative case analysis

Systems, and allow Rotation Systems to expand into government sectors. Excel Media’s medium- to long-term goal during the six months of the Intervention Scheme was to transition and separate the business into distinct services (consultancy) and new product divisions (the latter owning IP).

Excel Media’s cross-industry experience with other verticals was diverse and the company had created processes to manage and integrate each step of its practice. To begin the discovery phase, Excel Media expedited a two-day workshop with the host, Rotation Systems, to establish requirements and goals, and to set expectations. Previous cross-industry relationships had enabled Excel Media 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 Excel Media were integrated with sales, strategy and delivery processes: an aspect of operations that the company regarded as pioneering. Organisationally, Excel Media was structured to assign skills and processes to promote strong relationships with clients, whom they viewed as partners. In particular, Excel Media emphasised a culture of passion and having fun to form comfortable relationships, even when organisational cultures significantly differed. The Intervention Scheme was very similar to Excel Media in terms of the approach to problem-solving, communication and methods. In addition, during the discovery phase, the Intervention Scheme mentor proved to be of high value, overseeing the project flow and arbitrating issues that typically might not have been addressed.

Excel Media’s ability to innovate was challenged by a 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. Previously, open approaches have proved successful as a model for developing social media websites that involved both external industry individuals and user feedback. Usually, the skills, resources and capital came through the leadership of the Managing Director and the resourcefulness of the Creative Director. This is a model atypical of creative-media businesses which can be unstable according to the fluctuations of small business, however, the funding of the Intervention Scheme ensured that the company was resourced appropriately for the project. Together, the Managing Director and
Creative Director were striving for a culture of *intrapreneurialism* within their business, balanced with generating value (Lindegaard 2010).

The *discovery* phase revealed a perceivable skills gap with the Intervention Scheme host business, Rotation Systems: although the outcomes of the Intervention Scheme project were viable, the creative team anticipated that the internal processes and systems of Rotation Systems would need to develop digitally to fully streamline that business beyond the *incubation* stage to a fully fledged, usable and marketable product. Rotation Systems recognised this and expected to hire more talent to fill skills gaps as the franchising model developed as a business in conjunction with Excel Media and the Intervention Scheme.

Excel Media was matched with Rotation Systems for the intervention. Rotation Systems was an independently owned family business that began manufacturing large turntables for exhibition events, and went on to produce turntables for numerous applications and sectors around the world. This included architectural engineering, mining, and to a lesser degree, construction companies. When the Intervention scheme started, the company, based outside Melbourne in the rural area of Bendigo, employed around 15 people full-time. Rotation Systems specialised in rotational movement – by better leveraging, creating and saving space – through innovative design and manufacturing methods such as laser-cutting technology. As a family company, Rotation Systems valued relationships as deeply important, and through the Intervention Scheme, was looking for a clear and reliable relationship network to understand and share the company’s risk. The business relied on innovation to provide value; therefore, it was critical to build and maintain *rigorous relationships* in order to find the detail necessary to make the company’s products successful.

The aim of the Region 3 intervention project for Rotation Systems was to increase market growth by gaining a wider audience, as well as to use online technologies as distribution networks for the company’s products to gain entry to new overseas markets. Without the Intervention Scheme, Rotation Systems would have pursued a digital marketing strategy, rather than a creative development partnership, due to a general lack of knowledge and confidence surrounding creative digital media. On reflection and through Intervention Scheme observations, Rotation Systems believed that digital marketing would probably have been less effective.
With the Intervention Scheme as intermediary, Rotation Systems felt confident moving into a successful cross-industry collaboration with Excel Media, which resulted in the exploration of how Rotation Systems’ existing model may take advantage of digital media. Prior to the Intervention Scheme, Rotation Systems’ cross-industry experience had been limited to engineers, architects and some town planners via development applications; in these situations, interactions centred on Rotation Systems’ staff raising clients’ awareness of product specifications and capabilities. Rotation Systems had to invest a lot into understanding its partners’ processes in order to achieve a mutually agreeable outcome. Commercial agreements usually facilitated the information exchange, dealing with subjects such as IP, confidentiality agreements, (global) installation and, in particular, warranty.

A key obstacle for Excel Media was that, by its own admission, Rotation Systems lacked any specific digital-media experience internally, or any previous external engagement in the area. Although Rotation Systems was willing to engage across sectors, digital creative projects such as the Intervention Scheme, in a commercial sense, were far from the company’s comfort zone. Through the Intervention Scheme discovery phase, developing new ways of engaging with the creative process was a positive experience, and Rotation Systems formed a strong partnership with the creative team, which shared many similarities: size, development path and aspirations. Mentoring, in particular, provided a valuable mediation channel to overcome language differences between the industries (rather than organisational structures). For example, according to Excel Media, a lack of process knowledge often leads to negative perceptions and frustration; however, the Intervention Scheme and the mentors removed such conflict before it happened, managing expectations to jointly achieve positive results.

Rotation Systems regarded itself as highly innovative in its sector. Internally, it encouraged a strong culture of improvement, asking employees to come up with solutions as well as problems. Part of this culture stemmed from the early development days in exhibition events when the company was constantly challenged by competition, eventually forcing Rotation Systems to behave more innovatively. As a family-based SME, none of the Rotation Systems employees were formally trained engineers. Internal R&D was created through an inherent culture of innovation, with the principle focus on turntable technologies and laser-cutting.
techniques, combined with supplementary feedback and user input from customers, installers (such as welders) and manufacturers (including suppliers). Additional capital funding was perceived as the most likely scenario that would assist in Rotation Systems’ ability to explore a more formal R&D strategy to diversify into other markets, such as speculatively leveraging additional (shelved) IP. Without an injection of capital, the firm would have promoted innovation initiatives internally, such as providing ad-hoc support to sub-groups to conduct R&D during periods of manufacturing down time. Otherwise entrepreneurial and innovation activities were driven by the Executive Chairman and family father, who founded the company as well as initiating the opportunity with the Intervention Scheme. The rest of the family business leaned towards operational and internally focused entrepreneurialism, or intrapreneurialism (Lindegaard 2010).

For Excel Media, the success of the Intervention Scheme was evident in the long-term relationship the company forged with Rotation Systems; this relationship developed to allow Excel Media to propose a strategy of white-labelling platform software and development programs. By white-labelling the platform, Excel Media also hoped to expand into projects of similar nature in the future, thus leveraging the Intervention Scheme platform IP in other manufacturing and distribution networks, for instance, expanding into the government sector with initiatives like the Intervention Scheme.

For Excel Media, the Intervention Scheme project brought about structural change because the business, to an extent, was able to diversify and test its strategy of separating consultancy and IP ownership arms. For Excel Media, validation of the Rotation Systems’ Intervention Scheme platform was also an opportunity to stimulate the desire to develop and (co) own IP (as a white-label product). The vision for this new IP was to build consulting services into other industry groups, which in turn would also enable the cross-selling of rich media assets back to Excel Media’s core business. Excel Media saw the benefits of the online platform as an enabler for companies like Rotation Systems that need self-replicating (i.e. low cost of ownership) communications networks for distribution.

Described by Excel Media as “simple and self-learning”, the platform was modelled on the Software as a Service (SaaS) approach to licensing, whereby service features may simply be activated or deactivated according to customer needs, rather
than being re-developed. By employing the feature and benefits of simplifying distribution, as well as being user-friendly, the white-labelled platform also coveted the advantage of collecting valuable data metrics. As a result of learning of the joint venture between the mining intervention groups, Excel Media’s aim after the Intervention Scheme was to start a company with joint ownership of IP, split 50/50 with Rotation Systems. Through the joint sessions with the Intervention Scheme, the two parties became aware that they shared the same ambitions and vision for the project: to advance their own business interests and experience the benefits of the added resources that come with a mutual partnership.

A possible threat to the opportunity of the joint venture was of course a larger competitor with more resources creating a similar product (a perception driven by Rotation Systems’ experience with competitors easily copying their car exhibition designs). An additional concern was the threat of failure posed by potential customers dismissing their joint product due to experiences with other less targeted and less effective products in the market. This concern was focused, in particular, on how to strike the balance between appropriating value through IP, while fulfilling customer demands and the requirements of the product. Rotation Systems said it would address this particular threat by demonstrating, in collaboration with the distribution partners, the user-friendly qualities of the platform to be reflected by the simplicity of the product design.

Excel Media also separately connected with one of the Intervention Scheme non-runner firms, Brakes Inc. (part of the non-participant group study in this evaluation). During the Intervention Scheme pre-selection process, Brakes Inc. initially proposed the creation of its own platform for training suppliers and distributors called CarWorkshop. Brakes Inc. selected Excel Media during a competitive commercial bid from nine other competitors. The winning pitch was based on a variation of white-label product developed through the Intervention Scheme platform as the solution. For Excel Media, the platform created through the Intervention Scheme brought these connections and relationships together, with the advantage of creating spin-off work.

As a result of the discovery phase of the Intervention Scheme project, Rotation Systems embraced significant changes. During the subsequent incubation phase of validation and prototyping, Rotation Systems decided (through consultation and
agreement with the Intervention Scheme) to focus on developing a distribution model that responded to the challenges of operating on a global scale. Rotation Systems struggled with the logistics of getting people *on the ground* quickly to maintain its products (for warranty and maintenance), and its goal was that the platform prototype created with the Intervention Scheme would move the business towards a service-provider model. The white-label platform would assist distributors with supervision and installation, freeing Rotation Systems to focus more on creating value through design and engineering. The platform integrates Customer Relationship Management (CRM) information and Enterprise Resource Planning (ERP) systems. Other systems that may be integrated in the future include identity management, technical management, and project management components based on existing and/or open-source software. Together these systems combine to form the overall *platform*. The platform would *free resources* by outsourcing the selling, servicing and maintenance of products to a global network of distributors via online *switch on, switch off* tools. The increasing cost of manufacturing in Australia was a major factor driving this change, and the Intervention Scheme assisted Rotation Systems to act more quickly in developing its new model. Eventually, Rotation Systems hoped the result would be to also focus on outsourcing the less specialised elements of manufacturing, as well as the selling, servicing and maintenance. The vision for the platform includes a back-end framework that allows Rotation Systems to select and attract distributors, assess security, conduct due diligence and manage month-to-month dealings.

Through the Intervention Scheme, this new approach and business model aimed to support Rotation Systems in simplifying its processes, and compartmentalising distributor access to information, with an added benefit of potentially increasing brand awareness. Rotation Systems’ goal in the *acceleration* phase was to focus on outsourcing sales through the portal, and the company is 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, the aim for Rotation Systems was to break into new sectors with higher margins of return, such as mining, defence and outdoor installations. The long-term strategy for Rotation Systems was to look for investors and to finance specialist machinery to further develop manufacturing innovations.
Rotation Systems needed to retain a form of IP protection in its *standard* product range (products for which no patents were held) to maximise the success of this model; this IP protection was also an important requirement of the product for the company’s distributors. This is significant because sales were much higher in the *standard* product range than in the *specialist* product range; in the *specialist* range, Rotation Systems setup its own patents, and hence, were able to defend IP. The risks to this model succeeding are the huge costs associated with patenting components, including selecting which countries to register the patents in. As well as the risk of non-patenting, there can be too much focus on patents; in practice, patents are only useful if they can be defended, so extensive legal wrangling and litigation expenses are also a known risk. Rotation Systems hoped to mitigate these risks by maintaining its status as a product leader in innovation, and harnessing distributor/customer relationships created via the Intervention Scheme platform (e.g. the ability to digitally share ideas, collect IP and log ownership though date-stamping).

The health of the Intervention Scheme project was very good throughout all stages: risks and disruptions to the overall project were minimal and/or overcome and this success was validated by the milestone delivery checkpoints of the Intervention Scheme. Both project leads from Rotation Systems and Excel Media travelled to Santiago for a partner Expo run by the Australian Trade Commission with the intention of introducing and leveraging further cross-industry relationships. Together, the project leads pitched a video presenting the benefits of the platform they were developing with the Intervention Scheme to targeted South American mining clients. While the platform was a viable venture, without key stakeholders to manage the Intervention Scheme deliverables, the project experienced minor slippages.

Through the Intervention Scheme, Rotation Systems was provided with additional linkages to the mining industry through Pioneering Mining Innovations, the Region 2 intervention project’s host. One suggestion was to provide benchmarking services to Rotation Systems, which could provide additional (and unique) product data-sets, integrating turntable products into mining practices. Both Rotation Systems and Excel Media anticipated continuing to develop and grow their relationship beyond the Intervention Scheme. Rotation Systems and Excel Media were also engaging with local councils to identify four to five other companies for
the next phase of group pilot testing. Following this phase, both parties were still expecting to form a separate entity (a new company as a joint venture) to further develop the Rotation Systems network of franchisee distributors and to exploit the benefits of the overall platform white-label approach, just as Excel Media achieved with Brakes Inc.

5.5 PARTICIPANT AND NON-PARTICIPANT GROUP COMPARISON

Each intervention defined a specific problem with a solution that met the Intervention Scheme milestones and delivered a viable prototype or proof-of-concept that was tangible. Without the assistance of the Intervention Scheme, the next step for each project would be to engage in what has been described as the acceleration phase (Arteaga 2013; Leifer 2000; Lindegaard 2010). In this phase, we would expect to see business growth as the anticipated drivers of the proposed models propel and ramp up (Lindegaard 2010). Using the results of the user-group testing, (associated with digital media), for instance, would refine or further enhance the project outcomes into a complete commercial solution for each of the participant host business sectors (von Hippel 2007). This would not only advance the positions of both host and creative firms, whether joint ventures have been formalised or not, but would also drive revenues and customer uptake, and increase the viability of further investment. The precise development and commercialisation paths that would lead to commercial success were unknown outside the remit of the Intervention Scheme. However, during the evaluation that occurred at the end of the six-month period of the Intervention Scheme, it was anticipated that the relationships within intervention project teams would likely be maintained and developed further over the next 6 to 18 months in some extended commercial form. We now know, however, that one of the participant firms, the mining intervention host, Pioneering Mining Innovations, ceased trading due to a downturn in the Australian mining sector. This did not result in an update of more data services, as foreseen, but instead resulted in the sale of the host business and IP to a tier-one consulting practice, which led to the end of the joint venture between Pioneering Mining Innovations and Viz Dat.

What was apparent was that each creative team had also extended or enhanced the longevity of its business models, not only though the Intervention Scheme, but also through the strengthening of business development processes and exposure to new
business opportunities. All host participant firms accessed creative-media skills, knowledge and expertise that was lacking within their businesses. Although the Intervention Scheme helped to provide funding, all firms (including non-participant businesses) viewed the Intervention Scheme as reducing or limiting risks, and reducing the types of cultural mismatches experienced in previous cross-industry experiences. Participant host firms all adopted a new online-product focus, with definitive problem/solution specifications that were not apparent from the outset of the Intervention Scheme. This differs slightly from the creative teams: they had fee-for-service driven models that they wanted to further develop through the sectors they were exposed to during the Intervention Scheme. In addition to their secondary product and IP aspirations, the creative teams were less open – or exposed – to fully transition, or pivot, away from their fee-for-service models; instead, they embedded their creative skills in other sectors.

In Tables 5.1 to 5.4 we apply a scoring table on the outcomes for all Intervention Scheme participant host and creative firms, in comparison with the non-participant host and creative firms. The respondents addressed these questions using the 1–5 rating system:

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
Table 5.1

**Outcomes for participant host firms**

<table>
<thead>
<tr>
<th>Pioneering Mining Innovations (Region 2)</th>
<th>Rotation Systems (Region 3)</th>
<th>Regional University/Research Centre (Region 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1  Q2  Q3  Q4</td>
<td>Q1  Q2  Q3  Q4</td>
<td>Q1  Q2  Q3  Q4</td>
</tr>
<tr>
<td>5   5   5   4</td>
<td>5   5   4   4</td>
<td>4   5   4   5</td>
</tr>
<tr>
<td>Q5  Q6  Q7  Q8</td>
<td>Q5  Q6  Q7  Q8</td>
<td>Q5  Q6  Q7  Q8</td>
</tr>
<tr>
<td>5   3   5   5</td>
<td>5   3   5   2</td>
<td>5   2   4   4</td>
</tr>
</tbody>
</table>

**SCORE:** 37/40  33/40  33/40

Table 5.2

**Outcomes for non-participant host firms**

<table>
<thead>
<tr>
<th>State Museum (Region 2)</th>
<th>Brakes Inc. (Region 3)</th>
<th>Aspiration Software (Region 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1  Q2  Q3  Q4</td>
<td>Q1  Q2  Q3  Q4</td>
<td>Q1  Q2  Q3  Q4</td>
</tr>
<tr>
<td>1   4   1   2</td>
<td>1   4   1   3</td>
<td>1   3   2   1</td>
</tr>
<tr>
<td>Q5  Q6  Q7  Q8</td>
<td>Q5  Q6  Q7  Q8</td>
<td>Q5  Q6  Q7  Q8</td>
</tr>
<tr>
<td>4   2   4   5</td>
<td>5   3   2   5</td>
<td>1   2   5   2</td>
</tr>
</tbody>
</table>

**SCORE:** 23/40  24/40  17/40

Table 5.3

**Outcomes for participant creative firms**

<table>
<thead>
<tr>
<th>Viz Dat (Region 2)</th>
<th>Excel Media (Region 3)</th>
<th>Edumedia (Region 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1  Q2  Q3  Q4</td>
<td>Q1  Q2  Q3  Q4</td>
<td>Q1  Q2  Q3  Q4</td>
</tr>
<tr>
<td>5   5   5   5</td>
<td>5   5   4   5</td>
<td>4   5   4   4</td>
</tr>
<tr>
<td>Q5  Q6  Q7  Q8</td>
<td>Q5  Q6  Q7  Q8</td>
<td>Q5  Q6  Q7  Q8</td>
</tr>
<tr>
<td>5   3   3   4</td>
<td>5   4   3   4</td>
<td>4   4   4   4</td>
</tr>
</tbody>
</table>

**SCORE:** 35/40  35/40  33/40
Table 5.4

Outcomes for non-participant creative firms

<table>
<thead>
<tr>
<th>JPZ5 (Region 2)</th>
<th>Media Flow (Region 3)</th>
<th>East Digital Games* (Region 1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>Q2</td>
<td>Q3</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Q5</td>
<td>Q6</td>
<td>Q7</td>
</tr>
<tr>
<td>2</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>SCORE: 22/40</td>
<td>SCORE: 35/40</td>
<td>SCORE: 21/40</td>
</tr>
</tbody>
</table>

NOTE: * Aspiration Software was potentially both host and creative for Region 1. In addition, Intervention Scheme interviews were undertaken at the pre- and post-phases with East Digital Games to provide comparative data.

The scores from Tables 5.1 to 5.4 were then correlated against whether objectives were met, based on the outcomes each participant proposed (see Tables 5.5 and 5.6). All results were graded through the Intervention Scheme evaluation team, then shared with all participants, non-participants and mentors for feedback, input and cross-referencing.
### Table 5.5

**Business problems and objectives of participant and non-participant host firms**

<table>
<thead>
<tr>
<th>Intervention participant</th>
<th>Non-participant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Regional University/Research Centre (Region 1)</strong></td>
<td><strong>Aspiration Software (Region 1)</strong></td>
</tr>
<tr>
<td>Limited internal resources and expertise to engage digital creative team (Not Solved but more confident)</td>
<td>Limited availability of philanthropic funding to develop game (Not Solved)</td>
</tr>
<tr>
<td>Offline product limited to use in children in schools (Partly solved)</td>
<td>Provide a way to donate to a charity through social-media gaming (Not Solved)</td>
</tr>
<tr>
<td>Inability to realise potential of digital for social improvement (Solved)</td>
<td>Gain exposure to larger commercial companies to grow (Not Solved)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Pioneering Mining Innovations (Region 2)</strong></th>
<th><strong>State Museum (Region 2)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor ability to engage digital creative and deliver successful outcome (Solved)</td>
<td>Poor access to internal digital creative resources and external funding to engage digital creative teams (Not solved)</td>
</tr>
<tr>
<td>Inability to grow services model and open new international markets in the mining sector (Licensing model in place)</td>
<td>Greater reach of physical exhibits and objects (Being addressed – State Museum eXperience [SMX])</td>
</tr>
<tr>
<td>Lack of take up of services and value take-up due to inaccessibility of paper-based reports (Solved)</td>
<td>Improve education of cultural and national heritage to new virtual audiences (Being addressed – State Museum eXperience [SMX])</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Rotation Systems (Region 3)</strong></th>
<th><strong>Brakes Inc. (Region 3)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor understanding of digital creative capabilities (Solved)</td>
<td>Poor access to internal (and external through corporate network) of digital creative resources (Not solved)</td>
</tr>
<tr>
<td>Ceiling on growth due to inadequate international market reach (Model in place)</td>
<td>Greater awareness of products through online training (Process is beginning)</td>
</tr>
<tr>
<td>Operational and sales overheads distracting core manufacturing innovations (Partly Solved)</td>
<td>Limited CAPEX budget on full-blown program of work (Not solved – now three stages)</td>
</tr>
</tbody>
</table>
Table 5.6

Creative firm-based business objectives of participant and non-participant firms

<table>
<thead>
<tr>
<th>Interventions participant</th>
<th>Non-participant</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Edumedia</strong> <em>(Region 1)</em></td>
<td><strong>East Digital Games</strong> <em>(Region 1)</em></td>
</tr>
<tr>
<td>Develop a sustainable business around face-to-face training materials for education and non-for-profit (Model in place)</td>
<td>Apply digital creative gaming with neuroscience research (Not solved)</td>
</tr>
<tr>
<td>Build a sustainable client base though case-studies and long term relationships (Model in place)</td>
<td>Limited opportunity to create own products and entertainment games (Not solved)</td>
</tr>
<tr>
<td>Inability to develop techniques and understand mechanics to innovate in the learning environment (Model in place)</td>
<td>Gain deeper exposure and business sense working with other sectors (Not solved)</td>
</tr>
<tr>
<td><strong>Viz Dat</strong> <em>(Region 2)</em></td>
<td><strong>JPZ5</strong> <em>(Region 2)</em></td>
</tr>
<tr>
<td>Inability to develop business model beyond fee-for-service (Partly solved)</td>
<td>Define a clear identity and USP for the whole business (In progress)</td>
</tr>
<tr>
<td>R&amp;D into new areas of visualisation and data innovation (In progress)</td>
<td>Limited availability of key partners to oversee full project lifecycle (Not solved)</td>
</tr>
<tr>
<td>Define and enhance USP by generate unique and high value-IP (Solved)</td>
<td>Business sustainability and growth through project management (In progress)</td>
</tr>
<tr>
<td><strong>Excel Media</strong> <em>(Region 3)</em></td>
<td><strong>Media Flow</strong> <em>(Region 3)</em></td>
</tr>
<tr>
<td>Inability to enhance full creative potential and innovation through commercial projects (Partly solved)</td>
<td>Lack of financial stability to sustain focus (Model in place)</td>
</tr>
<tr>
<td>Develop opportunity for business model to grow through both services and IP ownership (Model in place)</td>
<td>Develop stronger commercial ties and brand awareness (Model in place)</td>
</tr>
<tr>
<td>Cultivate relationships beyond current customer base into new sectors (Model in place)</td>
<td>Enable services to therapists, physios and health carers for game-play rehabilitation (Active)</td>
</tr>
</tbody>
</table>

Despite the ultimate break of their partnership after participating in the Intervention Scheme, the mining intervention (Region 2) appeared to have the most mature outcome, predominantly due to Pioneering Mining Innovations having a clearly defined problem and vision of the solution. Although Pioneering Mining Innovations’ data-analysis services were mainly bespoke (reports were adapted according to each customer’s requirements and information), the methods, techniques and data sources were reasonably well-developed. Pioneering Mining Innovations recognised the opportunity to transform its services into products using creative media, which would also help it to meet the requirements of its customers. Pioneering Mining Innovations had previously attempted a similar project...
(SquidInk\textsuperscript{46}), which failed, although the company gained important insights from the experience that formed part of the Intervention Scheme problem definition pre-selection stages. Also in combination with its database content, Pioneering Mining Innovations’ strong IT skills meant that its data integrated readily into the backend of the Intervention Scheme product, and this improved the ability to be specific about the detailed outcomes and goals of the project. Unlike the Region 1 and 2 interventions, Pioneering Mining Innovations chose to use the discovery phases of the Intervention Scheme to focus on IP/legal elements and the creation of the joint venture between Viz Dat and Pioneering Mining Innovations.

For the education and manufacturing interventions (Region 1 and 3), the problem/solution process during the discovery phase was also varied. For the education intervention (Region 1), although the problem to move NeuroSmart online was clearly defined, the language and expertise required to articulate a solution was less clear. The change in the Regional University’s objectives, the addition of new funding stakeholders, and the exit of initial creative partner, East Digital Games, meant that the Regional University and Edumedia had to meet several challenges to achieve their final outcome, including the fact that the Edumedia team was working together for the first time as a business. For the manufacturing intervention (Region 3), problem definition was less clear: even during the discovery phase, the focus was on Rotation Systems’ need to change its ways of working and embrace creative media. Excel Media very quickly established a strong working relationship, and through its creative processes, accelerated the articulation of the opportunity with Rotation Systems to define the problem/solution. These processes validated the approach, which ultimately required that Rotation Systems undertake a significant business-model change.

The non-participant groups’ business models were more varied than the models of the selected Intervention Scheme businesses. In the non-participant businesses in Region 2 (State Museum) and Region 3 (Brakes Inc.), the ability to innovate through creative media was seen as a matter of business structure, rather than culture or

\footnote{\textsuperscript{46}It is worth noting that some of the project SquidInk work was also leveraged and reused due to the final Intervention Scheme outcome – a possibility that Pioneering Mining Innovations had not expected.}
skills. Following their unsuccessful bid and omission from the Intervention Scheme, the non-participant groups sought alternative funding sources and partnerships. The State Museum reorganised its structure, creating State Museum eXperience (SMX), which was dedicated to broadening delivery of the museum experience nationally and internationally through creative media. Brakes Inc., an automotive break-pad manufacturer and part of a larger global group totalling more than 450 employees, was able to sustain the exploration of its goals. The company’s objectives (proposed to the Intervention Scheme) were to increase market awareness of its products. As stated, the company has since pursued possible solutions through internal vertical supplier opportunities, and eventually selected Excel Media as the digital creative vendor.

Outcomes for the non-participant creative teams varied. The Region 1 non-participant business, a media and philanthropy gaming company called Aspiration Software, was a candidate as both creative team and host business. Neither Aspiration Software nor initial participant East Digital Media was able to significantly develop their business objectives. In contrast to these creative teams, the Region 2 non-participant creative team, JPZ5, more than doubled in size since the initial Intervention Scheme application because of its engagement with a global social-media brand and subsequent spin-off successfully acquired by another separate major social-media network. JPZ5 engaged with consultants who worked to improve external business process re-engineering in an effort to help the company define and optimise its business for more sustainable growth. Similarly, the digital creative non-participant group for Region 3, Media Flow, developed momentum alongside its health offering with growth in its interactive music composition arm to enhance its financial stability.

5.6 CONCLUSION OF OUTCOMES FOR PARTICIPANT BUSINESSES

This conclusion of outcomes solely focuses on outcomes of the participant businesses as the Intervention Scheme outcomes were assessed. The section that then follows is a summary of the outcomes six months after the Intervention Scheme was completed. In the mining intervention (Region 2) project, the vision was very specific: to convert Pioneering Mining Innovations’ data services into products through the visualisation enhancement provided by Viz Dat. A demonstrational
A prototype was developed, with the very specific objective (and deadline) of launching Pioneering Mining Innovations at a global mining exhibition. The prototype addressed the need to bring to life the enormous amount of data contained in textual reports, in a format that Pioneering Mining Innovations’ customers could understand and interrogate. The advantage for the customer was in the ability to capitalise on the operational efficiencies of Pioneering Mining Innovations’ feasibility studies through appropriate visual presentation. Previously, such data was buried in paper-based reports. Customers were 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 led Pioneering Mining Innovations and Viz Dat 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 the Intervention Scheme helped Pioneering Mining Innovations and Viz Dat to overcome. The first was persuading those in the mining industry that creative media and gaming methods could be used outside entertainment both accessibly and inexpensively. The Intervention Scheme also demonstrated the effectiveness of joint-venture collaborations to an industry in which fee-for-service work is the norm.

More than a prototype or proof-of-concept, the outcome of the mining intervention was close to a working product. This is because both teams collaborated openly, and as a result, reached a solution quickly once the problem was defined. The original goal was to launch at MineExpo in Las Vegas, but following the completion of the project plans, this goal was extended into a full road-show covering the US. Pioneering Mining Innovations intended to maintain traction by signing across existing customers in the US, as well as marketing to build product awareness in the new target markets. Figure 5.2 is an outline of the proposed partnership IP model between Pioneering Mining Innovations and Viz Dat that resulted through the Intervention Scheme.
The project’s main challenges were maintaining collaboration following the arduous joint-venture legal agreements and, for Viz Dat, understanding unfamiliar data-sets. Pioneering Mining Innovations may have underestimated how much the Intervention Scheme 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 Pioneering Mining Innovations through this transition, while the Intervention Scheme provided a platform for the goals and visions of both teams to be realised.

Both the education and manufacturing interventions (Region 1 and 3) were initially less advanced in defining the final deliverable outcome, and therefore, were engaged in concept building during the discovery phases. For Region 1, the discovery stages required a round of specification and requirements documentation, as well as visual concepts. Although the vision of extending NeuroSmart to a wider online audience existed, the Regional University and Research Centre group was unsure how to get there. As a result of working with Edumedia and the Intervention Scheme, NeuroSmart achieved its goals, not only by extending its audience from children to adults, but also by extending delivery beyond keyboard-operated computers to touchscreen devices. This broadening of audiences and digital platforms also benefited the wider research of the Regional University team, in that it allowed 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, the Regional University partner, in particular, was unsure of the necessary steps to achieve its goal, and it was the Intervention Scheme that brought focus to the process. The Intervention Scheme 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, which is an essential component that precedes a wider MVP specification of the broader NeuroSmart program. The steps taken through the Intervention Scheme helped to test the broader assumptions of taking NeuroSmart online to a national audience. The relationship between Edumedia and the Regional University has continued to develop additional components.

The Intervention Scheme helped to kick-start Edumedia’s business and key insights have been forged around the establishment of its internal processes and commercially informed business strategies. The Intervention Scheme has provided Edumedia with much more confidence in winning new business, and provided the Regional University and Research Centre with further 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, the Research Centre’s appreciation of how to engage with an SME will filter through to the wider educational institution of the Regional University.

The manufacturing intervention (Region 3) project goals were less defined. Both the host and the creative firms had specific business model goals they were hoping to achieve through the Intervention Scheme. Rotation Systems wanted to simplify its processes, compartmentalise access to information and increase brand awareness through creative media. Excel Media wanted to separate its business into two arms: services and consulting. Both companies identified the benefits that the Intervention Scheme 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 Intervention Scheme 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: Rotation Systems could use the product to manage and outsource/franchise part of its distribution network, and Excel Media 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 Rotation Systems’ internal systems), allowing suppliers and sales teams globally to create profiles then access financial and work tasks. Rotation Systems could also use the platform to manage its supply chain and overall brand quality. This would free Rotation Systems (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 Region 3 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. The Intervention Scheme provided early-stage seed funding, which enabled the first-stage release of a prototype that was a usable and viable product. Both companies identified the Intervention Scheme product as a new revenue stream through which they can leverage their expertise. This was not considered prior to the Intervention Scheme. The host and creative firms believed they had established a good long-term relationship and were aiming to develop additional rounds of funding over the next three to four years. The next steps to gain traction in the marketplace would 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 next challenge was for Rotation Systems, as the host business, to take advantage of the opportunity and maintain its position as an innovation leader, but through a digital economy.

All host businesses declared at the beginning of the Intervention Scheme that their staff lacked creative skills, knowledge and expertise. Hence, they were seeking the opportunity to engage those skills through external partnerships supported through Intervention Scheme funding. In all cases, the host 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 the Intervention Scheme. In the past, these businesses were unable to engage in cross-industry projects with the confidence that they could mitigate the associated risks. The Intervention Scheme also demystified creative media technology for those businesses. Innovation is recognising potential and expanding people’s ability to interact with the necessary agents and information. The Intervention Scheme empowered these small firms to engage in research and development through independent third parties that facilitated the activities.

To summarise, there is evidence that the valuable outcome of the Intervention Scheme resulted in the new IP generation, ownership and knowledge gained by participants. Consequently, each intervention produced varying models of IP ownership, all with the intent to support the longevity of dependent business models and encourage mutual responsibility by both parties, or in other words, cross-sectoral interoperability. Typically, a fee-for-service arrangement would have simply placed IP and related 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. The Intervention Scheme proved that when there is a material opportunity for the creative team to generate new and unique IP, the partners’ innovation culture flourishes. In the mining intervention, both parties developed IP under a separate joint-venture entity (75/25 split in favour of the host business). This is an indicator that through structured and seed-funded research and development, an SME foresees the ability to commercialise its innovations (Teece 1986; West 2006). Market validation of the Pioneering Mining Data platform did not happen during the intervention; however, indicators from all business stakeholders, including the expert analysis of business mentors, suggested that all outcomes were substantiated as commercially viable. Certainly, the evaluation of commercial success of each product can only be proven as such, once a product or service is assessed in the marketplace. In contrast to soft innovation (Stoneman 2010) and hidden innovation (Cunningham 2013), it may be that additional evaluation criteria may be required to evaluate innovation through cross-sector collaboration.

We depart this chapter with the outcome that such processes of innovation are complex, requiring further attention. As noted in Chapter 4, value can be created though the operational organisation of resources, but as is evident from the
Chapter 5: Detailed outcomes of the comparative case analysis

5.7 FINAL POST-INTERVENTION CONCLUSIONS

This conclusion follows these outcomes in a six-month period after participants were assessed.\(^{47}\) On completion of the Intervention Scheme, each of the project outcomes faced early market entry. Though in most cases it is difficult to surmise a conclusive end, this period is defined as a stage of business growth, or, using the D-I-A model more specifically, an acceleration phase of “Ramping up the fledgling business to a point where it can stand on its own, relative to other business platforms in the ultimate receiving unit” (Lindegaard 2010, 50). As anticipated, the relationships continued for all groups for a period after the Intervention Scheme outcomes were produced; however, the continuation for each project varied significantly.

In particular, the case of the education intervention provides an interesting perspective. In the evaluation, Region 1 scored lowest out of the participant groups: the outcomes for Edumedia notably scored lower than some of the non-participant creative firms. Edumedia was, however, partnered with a much larger host organisation, which was initially offset and balanced alongside East Digital Games. The withdrawal of East Digital Games during the early phases, combined with the increased project scope, amplified pressure on Edumedia’s resources. However, after the Intervention Scheme, Edumedia’s relationship with both the host firm (the Regional University and Research Centre) and the business mentor endured. During the later stages of the intervention, Edumedia re-located to the shared working space of the business mentor’s firm, which was also a facilitator for a start-up incubator. The incubator space was designed to stimulate a culture of new ventures through sharing experiences and support systems for innovation entrepreneurs to thrive, and in some cases, share information, skills and experiences. As a start-up business, Edumedia, while taking the opportunity to develop its business processes and

\(^{47}\) This stage of research was based on questionnaire surveys conducted with all participants, including the mentors.
validate its own business model, encountered significant structural changes. The overall duration of the project added significant stress and caused friction between the founders, several of whom departed the firm in a full-time capacity. While the Intervention Scheme did not extend its processes through these stages, the linkages between key project stakeholders were maintained: in particular, the mentor remained as a key advocate and facilitator for the intervention. Another significant factor was the broader program of work surrounding the ambitions for the NeuroSmart product. As noted, this program grew into other sectors, specifically from children to adults learning at home. Although the broadening of scope added stress to the Intervention Scheme outcome, a continuous project-based cycle of work did enable the creative media firm to continue working further prototypes in a larger form than what resulted from the Intervention Scheme.

By comparison, the intentions of both the mining and manufacturing interventions were to rely, perhaps unrealistically, on revenue generation in anticipation that it would drive the market entry of business models. It is unclear whether this was contentious or a source of friction between these host and creative firms. This poses questions surrounding the joint ownership of IP, in this case typified by the mining intervention. With the host firm dissolving its business due to cash flow issues, the joint IP developed was left floundering because the creative firm had limited resources to mobilise (or interoperalise) with related platforms currently in its sector or in the mining sector. Similarly, though for different set of reasons this occurred for the manufacturing intervention. Though neither the host nor the creative firm collapsed, structural changes were limited to those that also complemented existing business models. In the case of the host, the outcomes have failed to develop to a point where, as a new model, the distribution platform is standing on its own. Because of this, the creative firm has had limited resources to exploit the outcomes as a distribution platform, but was able to successfully develop into the manufacturing sector, as noted with Brakes Inc. Given all firms (as SMEs) were constrained by limited resources, there are perceived difficulties with new business models singularly reliant on a limited set of capabilities. It is logical to assume that models that take into account the entire resource-base of all members of such ventures are more likely to succeed through as many linkages that are available, for instance, increased access and positioning within value networks.
5.8 REFERENCES


Chapter 5: Detailed outcomes of the comparative case analysis

Brisbane, QLD: ARC Centre of Excellence for Creative Industries and Innovation.


Chapter 6: Creative interoperability: Mapping knowledge networks between groups

Chapter 5 described in detail the comparisons between the participants and the non-participant comparison groups and the role of the Intervention Scheme in facilitating, brokering and mentoring outcomes. In Chapter 6, the analysis reveals what conditions and knowledge bases were important and what group concerns were alleviated and combined in influencing the value outcomes produced. In continuing to examine group interactions by comparison analysis, this chapter introduces new methods to determine the interactions that were important through computer-aided visual maps. These visualisations not only produced new insights into how creative industries add value to other sectors, but also lead to the beginnings of a new model for evaluating innovation, which is identified as *creative interoperability*. The use of Leximancer software to assemble the interview transcripts into semantic network forms is explained and justified. This modelling process was a painstaking part of the thesis, requiring the assessment of various software options and lengthy empirical options testing.

This chapter is a paper co-authored by Greg Hearn. A version of this paper was selected by blind peer review of an extended abstract and presented to the XXV International Society for Professional Innovation Management (ISPIM) conference in Dublin, Ireland, in June 2014. The paper has been submitted to the journal *Innovation: Management, Policy & Practice*. In response to the examination process the version of the paper reported here refers to “comparison groups” rather than “control groups” but is otherwise identical to the submitted version.

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48 This research was funded by the Australian and Victorian Governments.
How do firms from different sectors, with different knowledge bases, combine to innovate? Specifically, how do creative firms co-create with firms from the education, mining and manufacturing sectors? We examine a funded Intervention Scheme comprising three cases, which each embedded a creative digital media firm in a firm from one of these other sectors (Swan and Hearn 2014a). Collaboration was facilitated within the intervention, and the subsequent knowledge flows were visualised through semantic network-analysis software. Though the intervention was an artificial experiment in one sense, each group produced substantial commercial real-world outcomes. This paper seeks to theorise the network-effect results in terms of creative interoperability. We build this concept by drawing on the theory of semantic networks, structural holes (Burt 1992, 2005) and structural folds (Vedres and Stark 2010).

Firms are continually being challenged to innovate amid the complexities of competition and the so-called network effects of contemporary commerce. Open innovation challenges the conventions of firms that look for, and confine, innovation within their own processes, structures and culture (Chesbrough, Vanhaverbeke, and West 2006; Vedres and Stark 2010). However, Vedres and Stark suggest that the solution is not as simple as finding ways to access information and dormant ideas; instead, it requires the generation of knowledge, which involves the dual challenges of recognising and implementing new ideas (Vedres and Stark 2010). Vedres and Stark (2010) argue that innovation thus requires familiar access to diverse groups and resources that recombine to generate these ideas; weaker and less familiar ties produced by bridging or brokerage, which are often associated with open innovation, are not sufficient. Vedres and Stark (2010) contend that implementation requires both the connectivity of groups and cohesive group structures that recombine and overlap to structurally fold – a process they describe as intercohesion. They claim that this process between connectivity (Burt 2005) and cohesion (Uzzi and Spiro 2005) through inter-group performance is pivotal to innovation. In this study, which involved several groups in a large-scale commercial intervention, we sought to identify and map the structures of networked knowledge that comprise the intercohesion process. Within the groups of the intervention, we identified and mapped these structures as semantic patterns connecting social relationships.
Through content analysis using Leximancer (Rooney 2005), we have attempted to reveal intercohesive group structures. Using this approach, we developed *creative interoperability* as an operationally relevant concept that builds on the theory of structural folds.

Interoperability as theory and method in literature has mostly been constricted to sectors, such as military, health and computing, in which technical systems are more able to exchange and make use of information. There have been calls in these and other sectors to go beyond the technical realm and view interoperability as being about more than basic linkages or integration across collaborating information systems. Pagano (2011) describes interoperability as a problem affecting the interaction of entities across multiple levels, which, in addition to the technical, includes organisational and semantic levels. We propose that this leads to an interoperability dilemma: on one hand are concerns with meeting the requirements of existing systems, and on the other, the challenges of the changing nature of business and markets, and adapting to continually evolving systems.

Individual organisations can be said to mitigate this interoperability dilemma through bridging “structural holes” (Burt 1992) by employing research and development approaches that involve interdisciplinary collaboration through brokers or intermediaries (Bogers and West 2012; Gassmann and Enkel 2010). Pagano (2011, 2) describes, for instance, that one approach for interoperability solutions is mediator-based and that “interoperability scenarios are complex and require the combination of multiple solutions to be resolved”. Third-party open-innovation intermediaries are now a growth industry across multiple sectors, demonstrating an increasing acknowledgement of the need for intercohesion.

We see creative interoperability as one such valuable frame of reference for such inter-group collaboration. In the discussion, we describe various types of interoperability relevant to broader innovation theory and innovation management. However, our research design begins by examining how creative agents collaboratively interoperate between sectors to produce valuable knowledge exchanges. Specifically, our research focus asks:

- What are the knowledge relations and network structures that occur when embedded creatives cooperate with firms in other sectors?
• Can the group creative interoperability of these network structures be modelled and explained?

6.1 RESEARCH DESIGN

This paper is grounded in the cross-case analysis (Yin 2003) of 12 organisations: half were participants in an innovation-intervention scheme funded by the Australian and Victorian Governments and the other half were non-participants who acted as the comparison groups. The participants, three creative digital companies, were paired with three host companies, one each from the education, mining and manufacturing sectors. Over six months, the participant companies co-created a prototype business innovation of commercial significance to the hosts. In one case, a joint venture was formed. In total, 16 key informants of these companies were interviewed before and after the intervention (between 2011 and 2012), producing 36 individual semi-structured interviews with focused questions (Charmaz 2006). In this paper, we use Leximancer, a relational content analytical tool to explore and theorise aspects of knowledge and linkages involved in the innovation process, as evidenced in the interview data (Smith and Humphreys 2006). As well as limiting possible researcher bias, such computational analytical tools can provide reproducible results useful for complex group analysis and the development of both hypotheses and theory. Although Leximancer is an interpretive tool that incorporates researcher insight, the results are constrained quantitatively using the program’s algorithms, which rely on frequency and co-occurrence of words to build network concept maps. Besides the effectiveness of such visualisation methods, as authors, it is important that we acknowledge that “the researcher is still the primary agent when using software in qualitative research” (Gapp, Stewart, Harwood, and Woods 2013). In this paper, we use Leximancer in a structured process of inference and theory building to advance the concept of interoperability and explain its role in the intervention.

6.1.1 Selection of participating companies

Companies were recruited using a publicly advertised call for participation in the government-funded Intervention Scheme. The objective of the Intervention Scheme

49 See www.leximancer.com
was to develop a system of *pilot innovations* focused on *business transformation* of capabilities to meet new market opportunities: for example, using digital media (*beyond a website or app*) to improve business productivity. At the end of the six months, the goal was to achieve a tangible outcome for each pilot project: an innovative concept and a working prototype with commercial significance.

Companies from different sectors registered an expression of interest, including a specific project problem their business faced that required a creative digital solution. Problems submitted ranged from concept discovery through to product transformation. All companies were invited to demonstrate their record in innovative and/or creative practice, and had to address an extensive eligibility checklist that included experience with multi-disciplinary work and sharing intellectual property. Firms that applied to be hosts were selected based on eligibility requirements, such as having a suitable project problem to solve, the commitment and ability to foster innovation, and the willingness to seek new markets and business transformation. Creative firms, in a parallel but independent stream, applied based on their digital creative problem-solving skills, and their ability to manage and deliver projects. Both streams of applicants were shortlisted by an independent committee operating on behalf of the Intervention Scheme.

All applicants were then assessed, and matched by the Intervention Scheme’s selection committee\(^50\) into three projects combining a host and a creative. In addition to the overall Intervention Scheme director and funding stakeholders, this process involved mentors who were directly assigned to each of the three projects. Each mentor was a neutral and independent professional adviser to both firms and was focused solely on successful project outcomes in the interest of the team and the delivery milestones of the Intervention Scheme. The process of forming the final partnerships for the projects was largely driven by the Intervention Scheme’s recommendations. In the final stage of selection, host firms were offered the opportunity to veto the creative team they had been matched with.

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\(^50\) The Intervention Scheme selection committee included the project director, stakeholder representatives from state and local funding bodies, the research and evaluation team, and the project mentors.
6.1.2 Participants and non-participants

Participant selection was a competitive process based on companies’ proposals. Thus, the sectors involved (education, mining and manufacturing) were not determined theoretically a priori, though relevance to the Australian economy was a factor in terms of the policy settings of the intervention. Table 6.1 outlines the industry contexts for both the participant and comparison companies.

Table 6.1
Intervention Scheme Participants And Control-Group Non-Participants, By Region And Sectors

<table>
<thead>
<tr>
<th>Firm Type</th>
<th>Region 1</th>
<th>Region 2</th>
<th>Region 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant host</td>
<td>Education (university)</td>
<td>Mining</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Participant creative</td>
<td>Digital services (education)</td>
<td>Digital services (visualisation)</td>
<td>Digital services (gaming, digital agency)</td>
</tr>
<tr>
<td>Comparison host</td>
<td>Digital services (gaming, social media)</td>
<td>Education (museum)</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Comparison creative</td>
<td>Digital services (gaming, social media)</td>
<td>Digital services</td>
<td>Digital services (gaming)</td>
</tr>
</tbody>
</table>

Once the host firms and creative firms were matched, all three projects began in parallel and ran for six months. The projects used various communication styles and technologies to conduct meetings and develop methods to reach milestones and deadlines for scheduled funding.

All participants, whether through business or project ownership structures, held high degrees of commercial responsibility for the initial conceptualisation through to the delivery and commercialisation of the project outputs during the six-month Intervention Scheme.

As the projects began, comparison control-group firms were selected from the pool of unsuccessful applicants. These groups did not receive the intervention but were free to pursue the challenge of solving their business problems through other means.

The research design anticipated three stages of discovery, incubation and acceleration (D-I-A), which are often used in open-innovation methods (Lindegaard
2010). As Figure 6.1 shows, we were able to map the Intervention Scheme against the D-I-A approach using interviews for both participant groups (including mentors) and comparison groups (Swan and Hearn 2014a). The Intervention Scheme featured heavily in the pre-selection and discovery phases in terms of goal alignment and reaching the outcomes and objectives for all Intervention Scheme participants (exemplified by formal and informal joint-venture agreements). In the latter stages of incubation and acceleration, there was less focus on the Intervention Scheme and more on the hosts and creative groups delivering outcomes.

Figure 6.1 D-I-A phases and interviews overlaid with intervention scheme

6.1.3 Using Leximancer

Both authors had extensive roles in the intervention context, but the analysis presented here is based strictly on the corpus of the interview transcripts. The first author, in particular, attended intervention meetings and accessed documentation for a period of 12 months surrounding the intervention. In-depth longitudinal case descriptions of the three projects were developed (Swan and Hearn 2014a). Thus, the current paper is one aspect of an overarching grounded-theory research program (Glaser and Strauss 1967). As Rooney (2005, 409–410) explains, Leximancer also learns in a grounded fashion what the main concepts in a corpus are and how they relate to each other. Content analysis can be done as either conceptual (thematic) analysis or relational (semantic) analysis. Leximancer does both, identifying concepts in the corpus and how they interrelate. In identifying
concepts and showing how they interrelate, Leximancer uses word frequency and co-occurrence counts as its basic data. Leximancer builds its analysis by using the frequency data and data about the co-occurrence of concepts to produce a concept co-occurrence matrix. Once a concept has been identified, Leximancer then builds a thesaurus of words that are closely related to the concept thus giving the concept its semantic or definitional content. The investigator can also drill down through a concept, into its thesaurus of words, and then directly into the chunks of text where those concepts and words are found. This allows the investigator to easily interrogate the text and interpret it in light of his or her own reading of the corpus and to apply various linguistic analytical techniques such as discourse analysis.

We used Leximancer to analyse documents and visualise patterns, themes and common concepts between groups. Leximancer is thus a quantitative tool to be used interpretively, producing stable and reproducible semantic visualisations of complex text data (Hine and Carson 2007; Rooney 2005) to support the theory-building process. In this way, the researcher interrogates the data iteratively, building theoretical models and testing them against the data constraints encoded in the verbatim transcripts of the respondents. We used Leximancer to create the maps included in the next section, which are visualisations of the discourses and knowledge exchanges (i.e., the semantic networks) between and within various groupings of the companies. The networks of concepts and groups of concepts (themes) were derived strictly from the interview data.

According to Rooney (2005), the centrality of network connections indicates shared language and is a useful measure when analysing group semantic similarity. Areas of mutual understanding and agreement are thus visualised by clustering between groups, while displaced group distance represents a degree of specialisation (Dodgson and Gann 2010). These types of visualisations and patterns are the basis of the analytic approach used here to deduce meaning from the network maps. In other words, we used Leximancer in part to map interview data, and this data helped us to iteratively develop a theoretical model for how network actors interoperate in the co-creative system of the Intervention Scheme (Ramos and Ford 2011).
6.2 RESULTS AND ANALYSIS

6.2.1 Overview of analyses conducted

The analyses that follow produce maps of the structure of the semantic networks that connected (or disconnected) the various companies involved in the intervention. Structure is an important emphasis because of the underlying theoretical focus of structural holes and folds. However, these depictions that we produce are based on participants’ utterances and statements, so the structural elements are in fact semantically constituted. Although our focus is structural in this chapter, we will refer to and exemplify the semantic content when appropriate. Table 6.2 presents a concordance that defines the highly connected concept hubs in terms of co-occurring concepts and quotes from the interviews. These hubs are the semantic structural nodes we refer to.

Table 6.2
Concordance table of concepts

<table>
<thead>
<tr>
<th>High connectivity concepts</th>
<th>Summary</th>
<th>Co-occurrence concepts</th>
</tr>
</thead>
<tbody>
<tr>
<td>project</td>
<td>Intervention Scheme collaboration between host and creative.</td>
<td>organisations, team,</td>
</tr>
<tr>
<td></td>
<td>Example: “The Intervention Scheme has provided enormous advantage and</td>
<td>collaboration, currently, outcome, focus</td>
</tr>
<tr>
<td></td>
<td>confidence in [the] project, and ways of working with interactive media</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and interactive media teams…”</td>
<td></td>
</tr>
<tr>
<td>business</td>
<td>Commercial activities aligned between host and creative teams.</td>
<td>understand, example,</td>
</tr>
<tr>
<td></td>
<td>Example: “[We] hadn’t done this type of business before – scope,</td>
<td>based, team, currently,</td>
</tr>
<tr>
<td></td>
<td>development plan, and then development.”</td>
<td>learning</td>
</tr>
<tr>
<td>process</td>
<td>Action of collaboration between host and creative to achieve mutual</td>
<td>key, stakeholder,</td>
</tr>
<tr>
<td></td>
<td>goals of the Intervention Scheme.</td>
<td>platform, assist,</td>
</tr>
<tr>
<td></td>
<td>Example: “…need to understand the process rather than the end result.</td>
<td>able, example</td>
</tr>
<tr>
<td></td>
<td>There's a chance that what [the host] thought they would get, is</td>
<td></td>
</tr>
<tr>
<td></td>
<td>different to what they thought to begin with.”</td>
<td></td>
</tr>
<tr>
<td>product</td>
<td>The result of the Intervention Scheme process in the form of a prototype</td>
<td>currently, level,</td>
</tr>
<tr>
<td></td>
<td>or platform.</td>
<td>prototype, focus,</td>
</tr>
<tr>
<td></td>
<td>Example: “…the immediate project broadening [the] product to[a] wider</td>
<td></td>
</tr>
<tr>
<td></td>
<td>audience – to people with learning</td>
<td>platform, key</td>
</tr>
</tbody>
</table>
development

The process of combing interactive media skills to create the product and new knowledge.

Example: “Lean development model minimises risk, develop[s] iteratively and deliver[s] at stages.”

work

Engagement of business activities between groups within or outside sectors.

Example: “When the project ends, focus on [the host’s] product will be how to work cross-industry [and how we] can work like the Intervention Scheme.”

innovation

Action and process of creating new ideas and knowledge associated with the interactive product.

Example: “[It’s] not the most innovative company in the world, but certainly [there] is innovation in-house.”

media

Interactive or digital media related to the Intervention Scheme project.

Example: “The Intervention Scheme has catapulted our vision into different areas [such as] moving into interactive media.”

data

Information supplied by host business for use by the interactive media to deliver product.

Example: “[The] value of host business data and transferring access to the value of that data set.”

market

Commercial sectors explore to release new product ideas.

Example: “New markets [are] opening up. Some interest comes through other [sectors] requiring large data sets but mainly through linkages to [our] sector.”

model

The system or process of how the business, in particular, the host, operates.

Example: “[The] host CEO underestimated how [a]change of business model would alter through the Intervention Scheme, [but we] caught that in time before [it started] impacting on development.”

prototype

Preliminary tangible version and output of the Intervention Scheme.

Example: “[The scheme] helped define the end point and adopt the process of prototyping with clients in a more formal sense.”

outcome

The end goal of the process of knowledge generation and commercial development.

Example: “…when the project started, [the host] had a view of an opportunity to take their offline project online, but [had] no idea how to achieve that outcome.”
Following Rooney’s (2005) method, we analyse the network of 1) ranked concepts, 2) concepts maps grouped into themes, 3) the relation of clusters and distance, and 4) inferences around theme by using theme-size setting. Concepts, and in turn, themes, can be traced in the data back to interviewees’ utterances or statements. As stated, Table 6.2 provides an illustrative concordance of the types of statements or utterances underlying the different concepts and themes (e.g. project, process, media, outcome). The adopted approach of letting the structures and concepts emerge (as opposed to being a priori driven by the researchers) was grounded in the corpus text and acts to constrain researcher bias (Crofts and Bisman 2010; Smith and Humphreys 2006). In general terms, we sought to discover which dynamics and network structures were significant in enabling intercohesion. We made comparative pairings of groups of companies to tease out the intervention’s effect and considered the different phases (before, during and after the intervention).

The semantic structure maps included in this paper:

- show the overall map of the semantic structure of the Intervention Scheme using all phases and groups (Figure 6.2)
- make comparisons between:
  - the overall semantic structure before and after the test (Figure 6.3)
  - participant hosts and non-participant hosts (Figure 6.4.1)
  - participant creatives and non-participant creatives (Figure 6.4.2)
  - participant creatives and participant hosts (Figure 6.4.3)
  - participants and non-participants, both before and after the test (Figure 6.5).

### 6.2.2 Mapping the language of the entire intervention

The first two maps (see Figure 6.2) include interview data from all three phases featuring participants and non-participants. The comparison and participant groups were both interviewed before and after the intervention, but the participant groups were also interviewed during the intervention. Figure 6.2 shows the most highly

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51 Before saving a concept map and exporting data, all visible concepts were set to 100%; we also settled on a theme size of 54%, which shows how other themes link to the main identified themes (Rooney 2005).
ranked concepts (Figure 6.2.1) with themes overlaid (Figure 6.2.2), as well as group types relative to this total semantic structure.

**Figure 6.2.1** Entire corpus, all groups and top Concepts

**Figure 6.2.2** Entire corpus as previous, with top Themes

*Figure 6.2* Entire corpus of concepts and groups as a spanning tree (Figure 6.2.1), with themes added (Figure 6.2.2)

Figure 6.2.1 displays the top concepts within the entire corpus, with groups represented shown in relation to these. The *spanning tree* (Figure 6.2.1) displays a network of most-likely connections between concepts and groups. Cluster position and distance within the concept mapping reveals the level of semantic alignment. The Intervention Scheme node is the most central *named concept*, which is the highest ranked concept in the corpus. The most important were *project*, *business*, *process* and *product*, all with a count equal to or greater than 22% (Rooney 2005). These results were expected because they were the dominant concepts and discourse for all groups, regardless of whether they were a participant. *What is most revealing is that the top 10 concepts across all groups are not clustered centrally, but show a significant hole of concepts and connections.* According to Dodgson Hughes, Foster and Metcalfe (2011), the absence of shared language and such a *hole* reflects disconnections. Figure 6.2.2 is the same data as Figure 6.2.1 but uses theme groupings and reveals the same conclusions about the dominant structural hole.

### 6.2.3 Comparing the total semantic network map in the pre-intervention phase with the post-intervention phase

In Figure 6.3, we are looking beyond evidence of *shared language* towards *knowledge exchanges* being constructed as the intervention progressed. Figure 6.3.1 represents each participant group mapped with comparison non-participant groups,
for both host and creative types in the pre-intervention phase. The four groups are displayed around the corpus of concepts and themes. At the pre-intervention phase, we see the top 10 concepts evenly split and clustered around the top two themes of process followed by project between creative groups and host groups. At this pre-intervention phase, we see no discernible shared language between the participant groups; in fact, they are split within the concept map. The relations of clusters and distance infer instead that, in this pre-intervention phase, the language and concerns of groups relate to their industry type. That is, there are shared concerns between creatives and between hosts irrespective of participation in the intervention. We may consider this a point of intersection between groups seeking “familiar access to diverse resources” (c.f. Vedres and Stark 2010).

Figure 6. Pre-intervention (Figure 6.3.1) and post-intervention semantic maps (Figure 6.3.2)

In other words, according to the data in Figure 6.3, we infer that the structural holes seeking to be bridged are different according to group type (Stark and Vedres 2013). Creative teams operate their businesses across a range of clients from a range of industries, and are thus more service-orientated and characterised as solvers. Host firms, however, are vertically positioned within specialised industries, and their problem-solving processes are more often product-orientated. These generalised characteristics are reflected in the connectivity of language in the Figure 6.3.1 corpus map: business, development, project and work are orientated towards both participant and non-participant creative groups; and product, innovation and media are orientated towards participant and non-participant hosts. Figure 6.3.2, however,
visualises significant change by the end of the intervention between groups and their concerns. The Intervention Scheme node is much more apparent as a central node and theme, and the discourse change of overlapping concepts between groups is more aligned to participants (compared with non-participants). For instance, the main cluster of concepts is orientated towards participant groups compared with non-participant groups on the periphery from the highest ranked concepts. Our next analysis further uncouples the corpus into separate comparative maps in order to understand, in more detail, which discursive patterns and concerns were bridged between groups. The analysis also examines evidence of possible structural folding.

### 6.2.4 Using comparisons between groups to examine structures and interoperability

![Figure 6.4.1 Host comparison of participants and non-participants](image1)

![Figure 6.4.2 Creative comparison of participants and non-participants](image2)

![Figure 6.4.3 Intervention Scheme comparison, participant groups only](image3)

*Figure 6.4 Comparisons of groups: participant and non-participant hosts (Figure 6.4.1), participant and non-participant creatives (Figure 6.4.2) and intervention participants (Figure 6.4.3)*

Starting with the mapping of all hosts (in Figure 6.4.1), we see a centrally located concept, called the process node, with shared concerns around development and interactive media. However, the complexity of this connection is also shown by the
knowledge pathway visualisation (represented by the black line through nodes). The many steps and connections via the Intervention Scheme node – the other most centrally named concept – illustrates that there are no clear direct narrative linkages between the host groups. This is surprising because participant and non-participant groups shared common sectoral issues in education and manufacturing (Table 6.1). A lack of direct semantic connection could be thought of as structural holes (Burt 1995) and it is not clear why some form of shared language within industry verticals was not more evident. One possible explanation for this structural hole is the lack of the knowledge or skills to innovate with interactive media, which was reported by hosts in all interviews.

Similarly, in the comparison of creative firms (Figure 6.4.2), we identify a structural hole. Although there is a central node – project – there is also a complex knowledge pathway and no direct narrative link. Surrounding this hole in both maps are many shared concerns – product, project and development (Dodgson et al. 2011, 1149) – with no explicit knowledge pathway to connect them. However, there are differences in the knowledge concerns between Figures 6.4.1 and 6.4.2: creative groups (which are more horizontally orientated) look for projects to apply their processes to problem solve; host groups (vertically orientated) problematise projects that require a creative process. Thus, intra-industry group comparisons of such concerns relate to actions, for example, goal alignment, rather than access to knowledge per se (Vedres and Stark 2010).

By contrast, participants were motivated to co-create across industries and Figure 6.4.3 reveals explicit links through the Intervention Scheme. This node is centrally located and it is also the highest-ranking concept, which we interpret as evidence of the Intervention Scheme acting as an intermediary between groups. The high level of this node’s connectedness with most-likely connected spanning tree concepts means the relationships within the Intervention Scheme are among the most important to both creatives and hosts. The chariot wheel arrangement around the Intervention Scheme node is also noteworthy for its hub and spoke distribution. This pattern is not indicative of discord between the participant groups because of the structural holes, as in Figures 6.4.1 and 6.4.2. Rather, this pattern of connection between concerns through a single node suggests distributed innovation (Barrett 2011). Although this connection does not automatically signify an open model of
innovation, it is suggestive, at the very least, of openness between groups and the Intervention Scheme. The thematic structure (depicted by the circles) further reinforces the Intervention Scheme as a connecting semantic structure.

That is, the notion that participant groups openly interoperate, evenly facilitated through the Intervention Scheme, is suggestive of structural folding (Vedres and Stark 2010). This pattern is composed of overlapping knowledge-transfer interactions between participant creative and host groups as familiar, heterarchical and open. Put another way, the Intervention Scheme, like similar forms of open innovation, can be thought of as an artificial system constructed to facilitate problem solving through the leveraging of external dynamic capabilities unavailable from within an organisation. As in Vedres and Stark (2010), with both the host and creative comparisons respectively (Figures 6.4.1 and 6.4.2), we find the lack of familiar ties between groups and access to diverse resources. Instead, in Figure 6.4.3 we find a series of necessary actions embodied in the intervention, which acts as a broker or intermediary.

To further develop the interoperability concept, we now interpret the distribution of these concerns between groups as a series of actions over time (i.e. the duration of the Intervention Scheme, see Figure 6.5). The changes in semantic space and structural holes between participant and non-participant groups provide further insight into the degree to which shared language facilitates knowledge exchanges and co-creation across boundaries.

6.2.5 Comparing pre-intervention and post-intervention phases by participant/non-participant and creative/host groupings

The analysis thus far has yielded rich results for mapping the knowledge network; however, we also conducted a time-based analysis to understand the Intervention Scheme as a network-over-time (Vedres and Stark 2010). The concept progression over time is visualised in the four maps in Figure 6.5. Rows map the pre-intervention phase and post-intervention phase iterations, and vertical comparisons are between participant and non-participant groups. That is, Figures 6.5.1 and 6.5.2 represent the progression of the participant groups semantically over time, while Figures 6.5.3 and 6.5.4 represent the progression of the non-participant groups semantically over time.
Beginning with the non-participant groups, Figure 6.5.3 shows process as the single knowledge pathway between groups, while Figure 6.5.4 shows two connector nodes: development and project. This is reasonable given that the outcomes of the proposals for non-participants at the post-interview phase varied enormously. Among the non-participant creative firms, one ceased trading, another was successfully involved in several high-profile global social-media projects, and the last completed its proposed prototype early during the pre-intervention phase, then abandoned it to focus on other business segments. Similar variations followed for comparison hosts, notably, with one host firm connecting with the manufacturing creative participants to deliver their proposed project without the direct mediation of the Intervention Scheme. Thus, Figure 6.5.4 shows a more fragmented semantic map than the participant map of Figure 6.5.2.

In Figures 6.5.1 and 6.5.2, the Intervention Scheme is the highest-ranked concept and theme; however, as expected, there is no common project or connections
between non-participant groups. Moreover, all top 10 concepts are highly centred and clustered around the Intervention Scheme in Figure 6.5.2, rather than being more fragmented between groups, as in Figure 6.5.1. This clustering suggests that shared language and common understanding developed in the Intervention Scheme.

We propose that this indicates the intervention engendered connectivity (Burt 2005) and cohesion (Uzzi and Spiro 2005), the two conditions that Vedres and Stark (2010) suggest are essential for generating knowledge and innovation. Figure 6.5.2 suggests further that the intervention engendered familiar ties not possible by bridging or brokerage (Vedres and Stark 2010). The hub-and-spoke clustering of both group nodes implies that they are open to one another and had more evenly distributed knowledge. If we support the proposition that outcomes for all three projects achieved significant levels of innovation (Swan and Hearn 2014a), we must, therefore, play close attention to where these structures overlap. In Figure 6.5.2, all themes proportionally overlap with the shared language of the Intervention Scheme, providing the semantic structure between groups. The three intersecting themes between groups and the Intervention Scheme are market (in proximity to the host group), prototype (in proximity to the creative group) and outcome (in proximity to the Intervention Scheme and intersecting at the groups). Overlapping with outcome, this represents knowledge generated between groups, and in all cases, characterises the business transformation, processes and models.

6.2.6 DISCUSSION AND CONCLUSION

We return now to the research questions:

- What are the group relations and network structures that occur when embedded creatives cooperate with firms in other sectors?
- Can the group creative interoperability of these network structures be modelled and explained?

By examining structural folding through this study’s Intervention Scheme, we can describe one aspect of what we have termed elsewhere creative interoperability (Swan and Hearn 2014a b). Swan and Hearn (2014a) argue that creative interoperability involves three components:
Chapter 7: Creative interoperability: Mapping knowledge networks between groups

- **organisational interoperability**, wherein project goals and processes are aligned by participating organisations

- **semantic interoperability**, which involves shared language meaning and thus dynamic capabilities

- **knowledge interoperability**, which facilitates specialist subject knowledge exchanges that require processes to both embed creative capabilities, and open collaboration models.

The idea of interoperability has contributed to the understanding of cohesive groups; however, there remains much work to be done on whether interoperability can be developed into a formal performance measure and predictive tool of innovation for both policy makers, and in-situ, for real-world commercial environments. As our results suggested, the Intervention Scheme artificially created a **heterarchy**: “an active rivalry of evaluative principles” (Stark 2009, 2) and a **friction (or dissonance) at the overlap**. Contrary to our initial concept of creative interoperability, we found the series of actions to be a process that is not one of standardisation or the “smooth flow of information” (Stark 2009, 18).

Through abduction (Osei Bryson and Ngwenyama 2011), we have surmised that it may also be the **discovery** and **incubation** of shared language that is the catalyst for innovation. Our iterative analysis has mapped the topology of the overall network of concerns, where they overlap between participants, and where they do not, in the case of non-participants. There are minor linkages between these groups – mainly through industry commonalities (such as creative and education sectors) and eventually, after the intervention, incidental commercial relationships; however, it is the heuristics of the Intervention Scheme that we suggest is verification of interoperability developing over time within a facilitated intermediary process. The Intervention Scheme set its goals during the first steps of that process, and in all three cases, produced tangible innovative **outcomes** along with significant business change, predominantly (but non-exclusively) for the participant hosts.\(^{52}\) We found interoperability present in both the **discovery** and **incubation** phases (See Figure 6.1).

\(^{52}\) Participant hosts went through what is termed in business parlance a **pivot**, whereas participant creatives broadened their portfolio of services and the vertical markets that they are able to connect with.
Theoretically, we propose that in order to accelerate within the value network, further interoperable partnerships, linkages and relationships need to develop. Shared language, albeit artificially stimulated through the Intervention Scheme, would need to be developed more deeply in some discursive form. However, as the intervention mentor in the education firm commented:

[W]hen the project started, the participant host saw an opportunity to take their offline product online, but [had] no idea how to achieve that outcome. The Intervention Scheme brought that to a head so a process could be made possible.

Leximancer mapping of semantic space with knowledge pathways linkages have proved particularly insightful in identifying indirect links that reveal layers and divisions that may not have been identified in such as process. Many future questions are provoked. If we consider a systems-theory view assessing openness, for instance, we find the degree to which group interoperability occurs across distinct boundaries, which prompts a critical question for open-innovation discourse: Does openness (see Figure 5.2) support entrepreneurship at the structural overlaps to some extent, or is it simply supplementing brokerage at the gap? The method and theory described in this paper are novel ways of examining innovation that involves different industry sectors working together. They constitute first steps towards developing a theory of creative interoperability. Much work is still to do, including conducting deeper analysis at both the discursive and individual levels, undertaking advanced time-based historical network analysis, and developing methods that identify other contexts in which creative interoperability may be deployed to further advance innovation.

6.3 REFERENCES


Chapter 7: Modelling Creative Interoperability: A Dynamic Characteristic of Inter-firm Innovation.

Chapter 6 mapped two types of knowledge exchanges as visual networks: 1) exchanges between the creative firms and host firms that were participants of the Intervention Scheme, and 2) exchanges between these participants and a comparison group of non-participants. The idea of *creative interoperability* was named to describe significant processes evident in the *discovery* and *incubation* phases that are often adopted by open innovation and other innovation methodologies. However, in order to fully develop the understanding of the dynamics, characteristics and network structures associated with collaborative innovation, Chapter 7 describes further semantic network analyses to map the *longitudinal* change in the semantic network structure throughout the intervention. This is theorised in terms of the theoretical difference between structural holes (Burt 1992) and structural folds (Stark and Vedres 2013). The importance of structural folding for creative interoperability is argued for, and demonstrated. This sole authored chapter has been submitted for publication to *International Journal of Innovation Management*. In response to the examination process the version of the paper reported here refers to “comparison groups” rather than “control groups” but is otherwise identical to the submitted version.

**ABSTRACT:** From innovation research, we surmise that entrepreneurial methods require businesses to maintain two simultaneous actions within competitive and complex systems: first, they must sustain operational capabilities, and second, they must find new opportunities for growth and value creation. Researchers using network perspectives to investigate how business capabilities are grouped have recognised that organisational positioning is changing toward heterarchical and open structures (Bogers and West 2012; Stark 2009). The heterogeneous characteristics necessary for co-creation have been theorised in policy discourse, but there is little
Chapter 7: Modelling Creative Interoperability: A Dynamic Characteristic of Inter-firm Innovation.

evidence of these characteristics in innovation systems analysis that focuses on small firms (Australian Government Department of Industry 2013). To address this research gap, we use empirical data to visualise how co-creation occurs across three sectors—education, mining and manufacturing—and how knowledge is distributed among groups that have collaborated in the discovery and creation of technological innovations. Elaborating on the theories of Stark (2009), we propose creative interoperability as a theory that elucidates countervailing interactions at the group level, where actors have “simultaneous allegiances to more than one order of worth” (Timmermans and Tavory 2012, 180). We model and visualise the change and complexity associated with creativity and innovation, and thereby, develop a model for creative interoperability as a heterogeneous and dynamic characteristic that is necessary for entrepreneurialism and innovation.

7.1 INTRODUCTION

*How do collaborative groups interoperate creatively to innovate?* Across economies, innovation systems consist of a variety of knowledge-sharing mechanisms, such as interacting firms. Critical to these knowledge flows are start-up ventures and SMEs which, according to the OECD (2011), act “…not just as knowledge exploiters, but also as knowledge sources, and increasingly, as ‘bridges of innovation’ which act as knowledge purchasers, providers and partners” (OECD 2011, 16). Further, in certain sectors, such as high-technology industries and the creative industries, SMEs are considered key players (OECD 2011, 16). However, Stark (2009) argues through network analysis that solely bridging or brokering knowledge does not create strong enough ties for the generation of new knowledge. Instead of trusting that there are ideas waiting to be found, Stark calls for stronger cohesive ties between groups. Although bridging structural holes (Burt 1992, 2009) is important, true entrepreneurship occurs within non-exclusive structures and the overlap of capabilities through intercohesion and structural folding (Stark 2009; Vedres and Stark 2010). This process of recombination provides compelling evidence in the creative economy of cross-sectoral embedded creatives (Swan and Hearn 2014a, b) and is supported with recent research on the dynamics of organisational capabilities and structural folding at the firm level in small and
medium enterprises (SMEs). For instance, Cacciatori, Tamoschus and Grabher (2012) examine cross-industry knowledge transfer through the role of the *systems integrator* and the codification of resources that are scarce in SMEs. Mayer, Somaya and Williamson (2012) find significant systemic *differences in capabilities* in entrepreneurial methods for group co-creation, which reveals the role of the SME in scenarios of *buyer* and *seller*. For Pagano (2011), cross-domain knowledge exchanges are blended into complex combinations of multiple solutions identified as “interoperability scenarios” (Pagano 2011, 1–3). Building on this work, and by clearly identifying the capabilities for cross-sectoral co-creation, the current research also aims to reconcile interactions across knowledge domains. We therefore use *creative interoperability* as a discursive and systemic narrative to advance the processes of entrepreneurship and innovation.

We examined the co-creation methods of intersecting groups within an Intervention Scheme in which three digital creative firms each formed new knowledge with a firm from one of three other sectors: education, mining and manufacturing. Previously, analysis of the formal structures that were created by each pair of firms found evidence of embedded creatives and structural folding (Swan and Hearn 2014a, 2014b). Adapted from Pagano (2011), Swan and Hearn (2014b) proposed three components of creative interoperability, namely *organisational, semantic* and *knowledge* interoperability, by examining interactions between participant groups throughout the six-month Intervention Scheme. We argue, like Pagano (2011), that interoperability is a problem that is not confined to pragmatic processes: it also appears in social and creative interactions between heterogeneous entities, inclusive of start-up ventures and SMEs. In this paper, we develop network techniques to visualise discursive formations that emerge over time (Carrington and Scott 2011). By accounting for these social and communicative ties, we examine how group interactions *recombine* to form creative interoperability scenarios. By *grounding in interoperability*, we thus model *creative interoperability* as a recursive framework for entrepreneurship at various levels inside firms, in what Mische (2011) points to as the “meaning structure of networks” (Mische 2011). Each of the three collaborative projects produced tangible, technological and novel

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53 Funded by the Australian federal and Victorian state governments.
Chapter 7: Modelling Creative Interoperability: A Dynamic Characteristic of Inter-firm Innovation.

outcomes that can be seen as characteristic of the innovation system they were part of, and this suggests that the current findings are relevant to theories of open innovation (Bogers and West 2012).

7.2 THEORETICAL PERSPECTIVES

Much research has been done to outline how innovation occurs across the boundaries of multiple organisations and structures that are positioned in a value network (Bogers and West 2012). The pursuit of heterogeneity in firm capabilities (Mayer et al. 2012) has given rise to a unifying theory of open innovation (Chesbrough, Vanhaverbeke, and West 2006) that problematises the vertical integration of organisational innovation capabilities (Bogers and West 2012). Open innovation theory has provided useful perspectives about knowledge flows across sectors containing multiple stakeholders, which underpin measures of firm openness (Vanhaverbeke 2009) versus appropriability (Teece and Pisano 1994; West 2006). The creative industries are considered one external source for open innovation because they are a constant source of new ideas (Swan and Hearn 2014a, b). However, it is the pecuniary relationships between creativity (Potts 2011) and value network positioning (Bogers and West 2012) that, for entrepreneurialism, prove to be among the most complex when intertwined with organisational values.


[the] evolution of creativity in humans would thus be argued to be a product of strategic competition in social groups, with creativity operating as a signalling mechanism of difficult to observe qualities, such as intelligence, foresight and rationality in relation to communicable models of the world. (Potts 2011, 47)

One form of Potts’ (2011) value co-created by groups, present at the firm level, is open innovation. It organises co-creation through knowledge flows of value networks and is motivated by commercial imperatives specifically to appropriate value (Bogers and West 2012). Value networks are perhaps the most fitting description of social and technical resources that are interactively organised into various forms (Lee, Olson, and Trimi 2012). Hence, current research pursuits tend to produce insights exclusively focused on mutual reciprocation of value between groups to explain how humans cooperate. By placing the foci of research grounded
in interoperability between human systems and groups, we develop insights into how groups emerge, how they create structural opportunities and when their interactions change. We argue, therefore, that the formation of communicative actions and processes (interactions), when combined with cultural forms (networks), can be a dynamic for co-creation.

Social-network analysis measures the structural properties of groups as patterns of nodes and ties (or edges) of social relationships between individuals to assess the level of reciprocity and reciprocation. Further enriched by technological advances in accessible (network) computing, as well as the broadening of algorithmic methods that subdivide cliques, the analysis of complex networks is advancing ways to measure overlapping communities and groups (Stark and Vedres 2009). Through mathematical formalisations, further advances in group theory elucidate cooperation strategies with competitive systems, such as game theory and evolutionary dynamics (Rand and Nowak 2013). Although such areas of research extend into complex learning strategies such as Artificial Intelligence, the study of human cooperation remains with social interactions and the mechanisms required for adaptation and intuition (Rand and Nowak 2013). Creative interoperability describes the process of intercohesion in which groups fold, overlap, repurpose and recombine (Stark 2009; Vedres and Stark 2010). Inside the value network, groups are motivated by commercial imperatives and act within duplicitous, non-exclusive (Simmel 1898) structures to serve multiple interests. Social-network analysis is thus appropriate for the study of creative interoperability because we see it as the capability of individuals or groups to co-create simultaneously in more than one constituted group or system or network (Mische 2011; Stark 2009). These processes may create groups, structures or even networks, but they must perform, either tactically or strategically, in the value interests of the entrepreneur, group or network.

7.3 QUALITATIVE SOCIAL-NETWORK ANALYSIS: LEXIMANCER

We make two key assertions that apply within the evolutionary innovation and systems approach. First, interoperability allows for cooperation that can be simultaneously strategic and intuitive. And second, the formulation of organisational cooperative alliances can be based on whether the cooperation will function: or in other words, produce spontaneous creative results grounded in the heuristics
available at the initial points of interaction. In the current study, we used qualitative social-network analysis (CAQDAS\textsuperscript{54}) to examine the empirical evidence in context with inter-organisational business networks that involve interactions between groups during value co-creation. Specifically, we analysed the discursive formations in interview data collected from participants in each Intervention Scheme project during the three phases of the discovery-incubation-acceleration (D-I-A) model,\textsuperscript{55} which were anticipated by the research design, and formed the interoperability theoretical framework in Table 1. In each of the three intervention projects, digital creative firms in the business of intuitive and interactive design methods were combined with a firm from the education, mining or manufacturing sector. The three selected education, mining and manufacturing host\textsuperscript{56} firms were previously unable to engage with or successfully cooperate with groups unaligned with their business structure.

We used this data-analytical approach to infer and model a complex and symbiotic creative process. Doing so produced surprising results and new insights unaccounted for in network-analysis literature that focuses on collaboration and consensus. These results substantiate Vedres and Stark (2009) advocating that processes of knowledge generation are different for brokers and for entrepreneurs. In addition, our application of network-visualisation techniques identified further distinctions concerning patterns of discursive moves between groups (Carrington and Scott 2011, 89). These complexities and dynamics may be accounted for only by positing interoperability as a method for co-creation and innovation. That is, we posit creative interoperability as a key mechanism to explain how firm interactions work together.

\begin{itemize}
\item \textsuperscript{54} CAQDAS is a computer-assisted qualitative data analysis system (Angus, Rooney, and McKenna 2012; Smith and Humphreys 2006).
\item \textsuperscript{55} See Swan and Hearn (2014a): The D-I-A method was developed by the Radical Innovation Group (http://www.rinnovationgroup.com), and is often used in open-innovation methods; however, it was not a formal method adopted by the Intervention Scheme.
\item \textsuperscript{56} As host firms, they pitched a problem challenge, which the creative media teams responded to in the role as problem solver with a potential creative solution.
\end{itemize}
7.4 TOWARDS A CREATIVE INTEROPERABILITY MODEL

This conceptual approach uses the Vedres and Stark (2010) model to focus in-depth at the point of structural folding for the three case studies introduced above. In previous examinations of these cases, we discovered creative interoperability by mapping the knowledge networks between groups (Swan and Hearn 2014b). By identifying the visual semantic gaps between groups at the start of the case study projects, we also identified the structural holes, which, by the end of the research, resulted in clearly discernable structural folds. In tracking discursive formations, and thus, the evolution of knowledge and skills between groups, we proposed creative interoperability as a mechanism that “involves shared language meaning and thus dynamic capabilities” (Swan and Hearn 2014b, 14). According to our previous work: “it is the heuristics of the Intervention Scheme that we suggest is verification of interoperability developing over time within a facilitated intermediary process” (Swan and Hearn 2014b, 14). Based on that finding, this paper demonstrates how a creative interoperability model may be extended towards a broader case for entrepreneurialism. Previously, we found computer-assisted qualitative data analysis systems (CAQDAS) valid in the extraction of semantic networks as concept map visualisations grounded in empirical data (Smith and Humphreys 2006). Here, we adopt a more detailed temporal approach towards the semantic data and isolated comparisons within a time series grounded in interoperability. Specifically, this method maps the change of discursive ideas and their recombination through the series of interviews, in particular, during the discovery and incubation (rather than acceleration) phases of the Intervention Scheme.

In our previous research, general notions of interoperability were developed into creative interoperability, comprising three core components (Swan and Hearn 2014a, 2014b):

- **organisational interoperability**, wherein project goals and processes are aligned by participating organisations
- **semantic interoperability**, which involves shared language meaning, and thus, dynamic capabilities
• *knowledge interoperability*, which facilitates specialist subject-knowledge exchanges that require processes to embed both creative capabilities and open collaboration models.

These core components were initially adapted from Pagano (2011), who sought to properly define interoperability for cross-domain and cross-community *data* exchange and integration. Pagano (2011) defines interoperability as not *merely technical*, but more significantly, as the *enabling effect* of the information that becomes available. Thrift (2005) examines business performance in relation to rapid technological standardisation and integration, which was conceived as “*a giant web of interoperability*” (Thrift 2005, 173). Although it resonates with Simmel (1898) and systems thinking, Thrift’s emphasis is the *fast-moving nature* of discourse, knowledge and capitalist production:

The construction of these institutions is heavily dependent upon technical issues like speed and interoperability but also demands outline human skills like facilitation (Senge et al. 1999). (Thrift 2005, 150–151)

By applying systems and network analysis, we understand interoperability as a set of cultural processes in which characteristics such as openness are present and account for knowledge exchanges that are critical for analysing group interactions and discursive formations. Put simply, we seek to understand how knowledge recombines into new forms and then how it is used, or as Mische summarises, how it is *constituted* (Mische 2011). Table 1 outlines our framework for creative interoperability, which is an adaptation of Pagano’s (2011) work that extends to culture and communication processes.
Table 7.1.  
*Interoperability theoretical framework*

<table>
<thead>
<tr>
<th>Interoperability dimension vs stage</th>
<th>Organisational (group with purpose, systemic)</th>
<th>Semantic (meaning, language, logic)</th>
<th>Knowledge (operational facts, information, skills, education)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Discovery:</em></td>
<td>Shared goals, process alignment, creative mediation</td>
<td>Shared meaning, dynamic capabilities, resource sharing</td>
<td>Intermediation, embedded capabilities, open models (access)</td>
</tr>
<tr>
<td>opportunity scoping (Plant business vision)</td>
<td>Structural folds, intercohesion (Stark 2009)</td>
<td>Integrated meaning (Thrift 2005), absorptive capacity</td>
<td><em>(Integrated) group ties, specialist exchanges</em></td>
</tr>
<tr>
<td><em>Incubation:</em></td>
<td>Value network integration, group disruption</td>
<td>Meaning of exchanged resources, systems distribution and amplification (infrastructure)</td>
<td>Knowledge generation (innovation), discursive recombination, <em>knowledge economies</em></td>
</tr>
<tr>
<td><em>Acceleration:</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>business growth ( Propel to ramp up)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1 uses the temporal framing of the *discovery, incubation and acceleration* stages (Arteaga 2013, 2014a, 2014b). It is important to recognise creative interoperability as a recursive process that repeats until either structural opportunities are created, or group resilience is "*more adaptable to change and innovation*" (Cunningham 2013, 34). That is, the creative interoperability outputs with each phase—*recombination, value creation and network embedding*—are dynamic. However, as Stark (2009) points out, heterarchical organisational forms
partake in *reflexive cognition*, and thus, the generation of new knowledge does not preclude group instability nor assure innovation.

### 7.5 RESULTS AND ANALYSIS

We used Leximancer to visualise and apply *creative interoperability* (Table 1) as a set of processes that changes over time rather than as structure changing over time. We focused on understanding emerging ties, not existing ones (Mønsted and Hansson 2010). Mische (2011) understands networks and discursive formations as *constituted* (created and organised, combined to a form) through communicative processes and interactions. In our three case studies, the emphasis was on developing *interactive* media solutions to business problems that required the learning of new skills for both groups. In particular, the emphasis of the Intervention Scheme was on the *gamification* segment of digital media (instead of solely technological solutions), or in other words, using *existing* technologies and repurposing their processes both digitally and interactively.\(^{57}\) Stark (2009) calls for sociological studies about the types of technology “we need to analyse the entanglements of actors and instruments in the sociotechnology” (Stark 2009, 152–153). Our previous analysis provides detailed case study descriptions including the selection criteria for participating firms (Swan and Hearn 2014a). In this analysis, we continued with grounded cross-case analysis (Yin 2003), but based on a temporal analysis (using the D-I-A stages) of the six participant companies using the creative interoperability framework.

### 7.6 DISCOVERY PHASE: OPPORTUNITY SCOPING

What we have called the *discovery* phase signifies the kick-off and initial stages of the project, which followed the *matchmaking* of each host with a creative team. At this stage, formal agreements had not been finalised between the Intervention Scheme’s funding bodies. All of the matched groups had met, approved group selection, and begun focusing on project goals. Figures 7.1, 7.2 and 7.3 visualise the knowledge maps for the three Intervention Scheme projects (1: education

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\(^{57}\) A Vedres and Stark (2010, 1157) reference to *recombining* novel forms of radio and telephone to form the cell phone.
Chapter 7: Modelling Creative Interoperability: A Dynamic Characteristic of Inter-firm Innovation.

intervention, 2: mining intervention and 3: manufacturing intervention) as they began the process of conceptualisation and opportunity scoping (Arteaga and Hyland 2013).

7.6.1 Education Intervention

The thematic map of Figure 7.1 demonstrates the existing disparities between groups. There were two firms at this stage that constituted the creative group, Edumedia and East Digital Games, which had distinct concerns: development and company respectively. There were also notable organisational differences at this point: Edumedia was very much in start-up mode as a new business, but East Digital Games was more established. The host, a university, was closely aligning itself with the language of the Intervention Scheme, evident in the fact that the highest ranked concepts between the host and the creative are interactive and skills. The host displayed a higher degree of openness with a hub-and-spoke distribution pattern indicating an openness to learning and new skills (Graham, Pegg, and Alder 2007). The NeuroSmart literacy and numeracy educational product is the highest ranked concept and theme, together with the main pathway link between the groups and the (named-concept of) Scheme, which was the key focus of interactions at this stage. Scheme and product have the largest knowledge gap (Dodgson 2008, 2012), but are actively being bridged between concept nodes and overlapping themes. At this stage of conceptualising solutions for the problem area, exchanges were mainly about understandings of operational gaps in knowledge (interoperability) surrounding the interactions between the product and digital media. The discursive formation of the scheme theme is not a broker per se; rather, it acts as a catalyst of the host’s business vision in order to share meaning with the external creative group(s).

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58 Following this stage of the project, East Digital Games ceased training in its current organisational form and Edumedia became the single creative team on the education integration.
Figure 7.1 Discovery phase: Education intervention

7.6.2 Mining Intervention

Figure 7.2 depicts the data from the discovery phase for the mining integration. It shows that while having polarised concerns—reflecting their specialisations—there are unifying terms centred on the project concept and closely aligned to the product concept. Both groups were arguably united in purpose and are positioned as overlapping themes of process and company. Process relates to the journey of creation and development, while company connects more to the business and organisational change anticipated by the mining firm. Up until the involvement with the Intervention Scheme, the mining host company had limited success in engaging consultative services, which, in some cases, failed to achieve outcome goals.

Figure 7.2 shows notable knowledge gaps that must be closed to seed the business vision. The challenge for the creative visualisation firm at this stage was familiarising itself with the business model and systems of the host, involving the knowledge exchanges of host data and platform[s]. (Learning is a peripheral but notable theme.) The concerns of the creative teams were strongly aligned with the development process and defining the product, and hence, the ultimate prototype output of the scheme.

The mining intervention’s scheme is closely aligned to the creative firm, rather than the host firm. The relationship of ties at this stage merely indicates that the
concerns of the Intervention Scheme and the creative group were closely aligned. This is unusual and inconsistent with the other two cases described herein and previous less comprehensive temporal research in which ties were either aligned with the host or more central (Swan and Hearn 2014b). One explanation is that at this stage the creative firm was heavily engaged in starting to formalise the joint-venture agreement between both groups in order to outline and combine intellectual property (IP) outputs. This suggests that both groups quickly recognised some of the conditions of interoperability, then, through the Intervention Scheme, quickly aligned creative value with compatible resources.

Figure 7.2 Discovery phase: Mining intervention

7.6.3 Manufacturing Intervention

The Scheme thematically shows in Figure 7.3 a stage when both groups were in the process of mediation in relation to knowledge gaps that were still occurring. For the manufacturing host firm, the discovery stage opportunity scoping was more fledgling (due to external funding issues), resulting in a less defined outcome for that host. The Scheme is the highest ranked theme and concept at this stage and has a high-density cluster of concepts surrounding it, orientating towards the host manufacturing firm. Those surrounding concepts—interactive, media, skills, platform and prototype—together form the overall picture the host and creative teams were building for the project outcome of a product. Business and development together form the most
likely knowledge-pathway concepts, and from this, both groups are inferring that long-term growth ties would ensue. For the creative group, Excel Media, this opportunity was not a short-term project, but a strategic move towards changing its business structure and diversifying its business, not only in terms of the sector, but also in terms of the type of skills and project. This shift involved building on existing methodological skills and development processes to add value, and applying them to a new type of development sector in the short term, and in the long term, to a separate consultancy unit. Supporting this change in strategy are the overlapping concepts of development, tools, collaboration and process, which are also aligned with the overall language of the Scheme.

\[\text{Figure 7.3 Discovery phase: Manufacturing intervention}\]

\subsection{7.6.4 Discovery Phase Summary}

The scheme’s role as intermediary bridge or broker was evident in all three cases; however, this role was somewhat varied in its stage of development because some integrations were more advanced than others, as particularly shown by the strength of the knowledge ties. This difference was notable in relation to the dynamic roles that the Scheme played in each case, indicated by the different concept-node positioning in each case. Shared concerns were aligned foremost with the education host firm.
rather than its two creative firms. The mining integration, though orientated closer to the creative group, required less mediation at this stage; whereas the manufacturing integration was the clear bridge between groups as relationship ties were still forming. The general discursive pattern suggests that through the firm interactions enabled by the Scheme, business visions were (being) aligned through a process of change, and were, therefore, dynamic.

7.7 INCUBATION PHASE: UNCERTAINTY REDUCTION

The incubation stage interviews were conducted at the midpoint of all Intervention Scheme projects. Milestones had been imposed and achieved for the Intervention Scheme, which included setting pecuniary objectives for the companies. Figures 7.4, 7.5 and 7.6 show that each project had gained traction and transferred its focus to the production of project outcomes. The discursive formations of the discovery phase had started to not only produce tangible outcomes, but also witness the development of business-model process development. The repurposing of business models for hosts into digital forms demonstrates not only recombining elements (Stark 2009), but also a significant pivot (Arteaga and Hyland 2013) of business models for all host firms.

7.7.1 Education Intervention

In Figure 7.4, the highest ranking concept in the corpus is project. Project is notably strongly located towards the creative firm, indicating, alongside focus, that the onus at this stage was on team performance. The creative firm has fewer hubs and spokes that would signify open distribution; therefore, it was closed, and this suggests that the onus was on short-term achievements. The host firm was most-likely open due to the prototype becoming a component of a much larger media initiative. This larger project also provided separate funding to the firm to digitise the product in several other market segments. The shared language of the Scheme now occupies the knowledge gaps that were evident in the discovery phase. Discursive formations, including the knowledge pathway, are visualised with the Scheme functioning both as the central theme and a highly connected node situated more evenly between the two firms. The shift of the discursive pattern of the Scheme between groups, from
host alignment towards central and creative concerns, is significant and indicative of a dynamic formation between the firms.

East Digital Games, one of the two creative firms in this integration, departed the Scheme as a result of folding its business. However, this event left no direct testable impact on the project (i.e. there were no knowledge gaps present in the corpus). For the host firm, because of additional external public funding, there was a major pivot and focus shift in product scope to a broader audience and user segment. However, the creative group’s ability to manage expectations versus the scope regarding outcomes for the project was also a point of notable friction between both groups in the education intervention. As the creative group project-lead said: “For a small company like Edumedia, [we] could end up a one-project company. All resources [are] being used by [the] Regional University pretty much full time.” This potential for imbalance was foreseen by the Scheme at the pre-selection stages and was the reason for initially adding the second creative firm, East Digital Games. Whether the imbalance was anticipated or not, the key problem is organisational interoperability in which the overall capabilities to disseminate information are in friction with the ability to deliver and manage the process.

Figure 7.4 Incubation phase: Education intervention
7.7.2 Mining Intervention

In Figure 7.5, *data, business, model* and *change* are the highest ranked concepts, all signifying the change in the host business, not just in process terms, but also in terms of a shift to a product based in visualising *data*. A shared language of the entire corpus is central and bounded by the *model* theme, signifying a much more unified understanding between groups. The dilemma facing the host organisation was the challenge to the existing structure and business *model*. A notable point of friction developed between the Scheme mentor’s action in facilitating change and the host CEO’s drive to embrace it (Carrington and Scott 2011, 90). The mining-host CEO claimed: “It’s about creating a framework for the whole creative product. We see [the Scheme] as the engine behind the meaningful product. Refining [our] business model has been linked and pushed hard by the [Scheme business mentor].” However, with high-value business coaching by the mining intervention mentor, the host and creative firms made a joint-venture agreement. This *pivot* is visualised in Figure 7.5, with the shift from *process* to *model* emerging as a result of the interactions between the creative group and the Scheme mentor, who was acting as the intermediary. The creative group signalled a degree of optimism around the *opportunity* theme and the connected concepts of *platform* and *project*.

Similar to the education intervention case, during this uncertainty-reduction phase, the creative group was perceivably closed (indicating immediate project focus), while the host was open, seeing the Scheme project as a tactical component of a broader strategy. *Organisation, company, work* and *people* are clustered within the theme of *company*, from which we can infer that the education host had structural concerns relating to the organisational capabilities of the creative firm. Arteaga and Hyland (2013) argue that adopting a more networked and user-experiment approach could *open* the project to vital feedback and linkages. The *scheme*, however, remains a vital linkage, with connected concepts (*data, model, change*) central and overlapping between groups. *Data* is the single key connecting concept between groups along the knowledge pathway, and therefore, simultaneously represents both process and structure. Although there are tangible components in the inter-group
knowledge exchanges, the visualisation tool also created new knowledge, which solved a problematic flaw that the host did not believe was solvable.\(^{59}\)

![Figure 7.5 Incubation phase: Mining intervention](image)

### 7.7.3 Manufacturing Intervention

In Figure 7.6, the Scheme remains the dominant theme; however, product has become the highest ranked concept. The movement of concepts also includes Scheme containing the majority of highest ranking concepts in this corpus, thus it is the most discursive combination of note. It also is the most likely connector along the knowledge pathway between groups, and the immediate step for the host between project, work and the creative group. Product aligns and strongly connects with the host group, as does the emergence of process. Together, by following the spanning tree, concepts semantically form to combine an integrated meaning of important [to]

\(^{59}\) The host previously employed a manual method called factoring to account for data anomalies and unknowns, which the visualisation tool was able to resolve computationally.
understand innovation process. Another centric semantic cluster to stem from Scheme is model and development, eventuating to platform, prototype and tools. Both combinations indicate that a tangible knowledge input is being absorbed as meaning, as does process, into each organisation. The formation of a new distribution model would be a significant pivot for both companies, and therefore, a potential area of friction and dilemma. Although the creative group signified the desire to develop a relationship with the host partnership, which could include future IP sharing or a joint venture, it was more outward facing, and hence, cautious. This group was notably more cautious than the other creative teams at this stage, most likely because they were also searching for other industry networks to validate the platform approach to reduce uncertainty (Arteaga and Hyland 2013).

Figure 7.6 Incubation phase: Manufacturing intervention

7.7.4 Incubation Phase Summary

The structures and processes that emerged have been substantial. We found, in each case, new audience segments (education), new business models (mining) and new distribution channels (manufacturing), which, prior to participation in the Intervention Scheme, were not conceptualised. That they occurred at the firm level is also significant and evidence of recombination and structural folding between groups.
The significance of the Scheme’s emergence as an intermediary process suggests that creative interoperability encompasses a diversity of dynamics, not just one set of system or group interactions or capabilities. The integration of both capabilities and meaning also simultaneously produces friction. It was at this stage, with each intervention, that friction developed between different aspects of the projects:

- education: between capability and managing expectations
- mining: between the structural changes to the business model and the new opportunities for data application
- manufacturing: between validating the distribution model with other sectors and embedding the process knowledge.

The integration of ties and knowledge appears to be connected to the strength of the emerging discursive formations. The pattern of the Scheme is the epitome of value creation, which was embraced throughout this stage as the vehicle for the emerging processes, despite the fact that structurally direct involvement was diminishing. For instance, the role of the Scheme mentor varied depending on the level of involvement and group capabilities. This variation, at the level of the intermediary, suggests that this role interoperated organisationally; that is, not between gaps (Burt 2005), but inside the overlap (Vedres and Stark 2010). However, validating these discursive movements is relevant to open models in the creative interoperability framework. Assessing creative value would require significant user-experience experiments to reduce subjectivity, risk and uncertainty in the incubation phase of prototyping. This poses two possible issues: either the D-I-A approach is less relevant than proposed or SMEs cannot rely on prototype user feedback and validation due to limited (network) resources and capabilities. The acceleration phase of this temporal analysis thus also examines the ability of each firm to grow and develop these recombinations.

### 7.8 ACCELERATION PHASE: BUSINESS GROWTH

We have used the acceleration stage to define a more reflective period in which each project delivered outcomes for the Scheme that were approved by all group
Data for this phase included interviews with the Scheme’s business mentors. A post-project questionnaire provided additional narrative to the discursive content, and measured not only perceptions of each integration’s successes, but also areas of commercial and strategic growth for each firm.

### 7.8.1 Education Intervention

In Figure 7.7, both groups are noticeably positioned closer in the corpus than in the previous phases. There are very specific ties and connections along the spanning-tree concepts *project* and *scheme*, the shortest shown in the knowledge pathway and highest ranking concepts. *Project* is the highest ranking connecting concept between the groups. Resourcing was a concern that continued from the previous phase, as both groups looked to further co-create in projects beyond the *Scheme*. *Time* is a new concept theme to emerge, which is important to the creative team and relates as such to resourcing. As a start-up, the creative firm rapidly learnt to appreciate balancing resources with enduring benefits like new business skills. As the business mentor noted: “The creative team benefited [most] and needed most assistance. Essentially, [the] company was formed for this project. [They were] [l]earning business fundamentals and working together in this context, so [they] benefited from the Scheme.” For the host group, in contrast, *collaboration* and *approach* are influential intersecting themes to emerge. As the education host explained: “[We are] able to confidently articulate ways to work with professionals in [the] IT and interactive media [teams] and understand what they can offer [in the] process [of] making a minimal viable product.”

The *project* became the discursive pattern that produced the strongest ties because its meaning now extends beyond the scope of the scheme. Organisationally, the host group experienced little change, with the exception that at this stage its core research had the benefit of receiving a *feedback loop* because the prototype provided data that was unexpected. In a sense, the outcome of the Scheme, positioned as a *minimal viable product* did serve as a way to test the uncertainty about the ambitions of an overall program of digital enabling for NeuroSmart. The creative firm

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60 A minor exception at the time of interview was the manufacturing integration: in this case, the host group was awaiting final approval. It was not anticipated to be an issue, and subsequently, approvals were all met.
experienced many changes that led to group instability, with one of the three founders surviving in the same role (one left the firm, and the other consults back to Edumedia). The creative firm was, however, able to successfully grow beyond being a one-project or one-client company. The knowledge flows in Figure 7.7 illustrate fewer gaps in knowledge since the discovery phase, but also fewer discursive groupings, indicating misalignments outside of project concerns. Although the creative firm’s academic capabilities recombined with the creative firm’s digital media skills, the interoperability interactions that endured through the educational typology of exchanged meaning were singularly aligned with project goals.

Figure 7.7 Acceleration phase: Education intervention

7.8.2 Mining Intervention

Figure 7.8 shows that the Scheme replaced model as a key connector between the groups, but the discourse (themes) are also fragmented. Through these divisions, the knowledge pathway shows model, [Scheme], data and work. The host transferred its focus to the practical demonstration of the prototype in order to develop sales, which suggests that the Scheme is viewed, by the host, as a discursive process between groups. The host, in preparation for an overseas trade show, was aligning with and
engaging with *industry* partners to attend for the unveiling of the prototype. Although present, *product* is on the periphery of the main corpus, surprisingly distant from the creative group and representative of an overall discord away from the Scheme.\(^{61}\)

*People* was a major organisational concern of the host firm—a concern that was always close to the host, but inflated as the scheme neared completion. This perhaps suggests that organisational changes were looming because a *skills gap* certainly developed during the Scheme. The creative firm remained optimistic and its concerns were less complex: *stage* was repeatedly used as a concept referring to *next* or *later* stages, which indicates that the creative principal fervently believed that there would be further development, work or relationships between the groups. He later reflected that he “would have liked [the Scheme] to go further”. However, after the project was completed, organisational changes in the host mining firm and the lack of business growth from the economic slowdown in the mining sector unfortunately meant that it ceased trading. The creative firm continued, but its joint venture also ceased because there was no longer legitimate data to drive the prototype. The interoperability requirements omitted were the capabilities of both firms to integrate existing service-based business models into a product-based one, a key gap in knowledge that was not recognised in the project.

\(^{61}\) *Model*, for instance, is associated more with *development* models than in previous phases, when *business* model was the main discursive pattern.
7.8.3 Manufacturing Intervention

During the earlier phases, the manufacturing integration experienced less-dramatic changes than other comparative participant groups. However, Figure 7.9 indicates a discursive move away from product-related concepts, towards business-driven outcomes, but not technology-driven ones. The creative firm had various immediate interests; however, the discursive alignment is generic and lacks focus on advancing the product. The creative firm’s focus was instead on advancing business, and arguably, this was at the expense of developing newness or knowledge generation. However, the alignment of spanning-tree concepts between product and—in particular, time, take, work, focus and funding—indicates a growth process comprising a series of business actions. As the project leader of the manufacturing host firm commented: “Yes, [we] have fundamentally changed [our] business through the Scheme [which acted] as [a] catalyst.” That is, at that time, the host firm was not looking for revenue streams through existing open connections or additional recombination partners through their distribution network. The creative team’s capabilities remained focused primarily on current project outcomes while it was
simultaneously “looking for government funding, angel investment, but [with the] focus on [the] viability of [the] current product, maybe [our] own joint venture and own funds [but we] must sign this period off first”.

Further evidence of these simultaneous processes is the fact that a linkage was developed in combination with a comparison group host firm. Searching for revenue streams is essential for small business to maintain the necessary resourcing and capabilities to prosper. It is the constraints of these capabilities for smaller firms that suggest open or distributed models. When challenged by other pecuniary and competitive opportunities in the value network, creative value capabilities are overridden when further integration and knowledge is generated. Pecuniary interoperability requirements, such as cohesiveness of revenue streams, meant that the groups did not continue to recombine and co-create because there were no incentives and no resources to integrate their capabilities further.

*Figure 7.9 Acceleration phase: Manufacturing intervention*
7.8.4 Acceleration Phase Summary

The final discursive patterns to emerge in what may contentiously be described as the growth or acceleration phase, may be summarised by their diversity. Although significant new markets, distribution models and business models were created, and innovative prototype solutions delivered, the enduring tangible results were varied among the groups. Out of the three scheme projects, the education integration was the most enduring, with the strongest interoperability ties being the sector typologies, specifically semantic and knowledge interoperability. However, as one of the participants remarked, they were now “stuck together”, suggesting that organisational interoperability with other groups would be more difficult than with the current group arrangements. As Stark explains, such is the “rapidity when working in the digital medium” (Stark 2009, 107), that the challenge of revisiting the process of further integrating group ties and knowledge exchanges is prohibitive. The status quo of embedded intercohesion, which in innovation Vedres and Stark (2010) suggest often undermines group stability, was considered to outweigh the combined performance of both groups. The co-creation efficacy of the education integration produced enough ongoing creative interoperability, creative value, integrated knowledge and meaning to embed the creative firm within the education host firm (Swan and Hearn 2014b). Other creative groups were unable to continuously recombine creative interoperability with reciprocal conditions: in the mining integration, aligning the business model did not ultimately succeed in transformation, and the manufacturing host did not align its revenue streams. The outcomes of the acceleration phase also raise questions about whether open innovation adequately formulates the simultaneous exchanges required for absorption and recombination.

To summarise, the results and analysis have illustrated how a creative interoperability framework can be applied as a discursive narrative and can explain complex systemic interactions. The emergence of the Scheme as a discursive process itself provides empirical evidence of a systemised set of interactions. These interactions are reciprocal and produced outcomes that were co-created. This reciprocation can be explained through creative interoperability and its enduring benefits as value network embedding (Swan and Hearn 2014b). Creative interoperability includes diversity and dynamic structures that assess overlapping
capabilities and sources of friction, both in short-term tactics (such as prototype development) and strategic creative value (as in business-model development).

7.9 DISCUSSION AND CONCLUSION

The action problem for entrepreneurs, as Stark (2009, 2013) suggests, is not access to knowledge or information, but intercohesion. As we have empirically shown, however, for SMEs, generating new knowledge does not inhibit failure, even if it is a temporary phenomenon. We suggest that, for SMEs and start-ups, action through structural folding requires embedded value networks, rather than intercohesion. This embedding must meet conditions of creative interoperability that constantly assess value at multiple levels across networks. This study found that, overwhelmingly, it was through the discursive pattern of the Scheme that groups continuously assessed the evolution of project, product and process concepts. In other words, the structural fold was centred in the node we called the Scheme, and was found where shared language evolved to the point that it became a colloquial process that changed over time. The Scheme, hence, is the discursive signifier interoperating on multiple formal and informal levels, enabling the recombination between groups. The greater the interoperability in the network, the greater the chance of validating that the knowledge generated is robust with regard to viability. At the seedling level (e.g. SME or start-up project), with precious few resources and capabilities, the ability to create network robustness is critical in relation to market adaptability, appropriability and pivot through innovation cycles and creative disruptions (Arteaga and Hyland 2013; Schumpeter 1942). As Stark reiterates, “Entrepreneurship is the ability to keep multiple evaluative principles in play and to exploit the resulting friction of their interplay” (Stark 2009, 34). The search for the trigger points of interoperability along the value network, while keeping the modes of production operating, is necessary to the process of implementing and executing the new knowledge generated. This process, or as Simmel suggests, the “reciprocal exercise of forces” (Simmel 1898, 667), also has the capability to generate new knowledge, and with it, structural opportunities.

Previously, Swan and Hearn (2014b) showed that networks can be both structures and processes that occur simultaneously and reciprocally. However, Mønsted and Hansson (2010) suggests that it is process, rather than structure that
changes over time. With this current research, through the analysis of the ties that emerge rather than the established ones, we have demonstrated that creative interoperability may be understood as process and structure. The creative interoperability ties which emerged can enable not only co-creation between groups, but also group positioning within the value network and therefore innovation system. We propose that creative interoperability has promise as a theory of intersecting interactions that can be applied in efforts to realise a more complete view of innovation systems, which is inclusive of SMEs and start-up enterprises. We have also aimed to invigorate debates surrounding co-creative innovation with our reciprocal description of value in network-analysis terms.

Thrift (2005) regards capitalism not as a complete system, but as a set of networks evolving indefinitely. Stark (2009) adds that systems, such as capitalism, are evolving ecologies of simultaneous processes of convergence and divergence in the search for integrated meanings: integrating knowledges of knowledges. For Cunningham (2013), such integration can be seen through the absorptive capacity of the creative sector and its ability to recover quickly and adapt to change brought by uncertain and unfixed innovation processes. Creative economies may also be viewed as integrated value networks because they contribute to wider innovation systems, integrating as both supply and demand (Cunningham and Higgs 2009) by appropriating and repurposing innovation to form new group discursive patterns. Stark’s (2009) more recent network analysis explains new organisational forms as heterarchical, heterogeneous systems that consist of the continuous evaluation of interwoven multidisciplinary performance principles.

Social-network analysis and the study of patterns and ties in relational settings, according to Mische (2011), comprises a relational sociology to overcome traditional antinomies between structure and agency (Carrington and Scott 2011, 88). Both Mische (2011) and Stark (2009) advocate that understanding these tensions, frictions and dilemmas as both productive and creative is entrepreneurial so long as they may disrupt the norm to produce innovation and can be organised and harnessed through innovation systems. Therefore, if the value network is a heterarchy of worth that is complex and adaptive under constant evolutionary change, then what are the action principles at play for the entrepreneur? Much work remains and in future research we
hope this framework may extend to broader methods with the aim of solving dilemmas rather than focusing on creating them.

7.10 REFERENCES


http://www.grdi2020.eu/Repository/FileScaricati/9a85ca56-c548-47e4-8b0e-86c3534ad21d.pdf


Chapter 8: Conclusions

8.1 INTRODUCTION

This thesis has delivered a new concept for innovation and innovation management, informed by an understanding of the linkages between creating new value, sectoral process preconditions and reciprocal group actions. In a cross-sector arena that is perhaps under-examined, these investigations have also broadened innovation research by extending attention towards investigating collaborations between SMEs. Instead of supporting solely the development of commercialisation, the Intervention Scheme instigated an inquiry of the systems, processes and conditions necessary for collaborative creativity, innovation and entrepreneurship. Supporting entrepreneurship and collaboration between small businesses (including start-up firms) across different sectors is an important part of the narrative between the creative industries and innovation. For the creative economy, a genuine innovation culture is, by its very description, one of risk-taking and disruption rather than predictable growth. The theoretical outline of creative interoperability is thus a study of intersections of the organisational, semantic and knowledge components necessary for such an innovation culture. In this final chapter, the sections that follow summarise the study’s findings, together with the propositioned theoretical framework and model. A discussion about the limitations of this study and possible future directions of research concludes the chapter.

This conclusion begins by returning to this study’s research questions, which have been used to structure the research outcomes:

- **Research Question 1 (RQ1)**: How can creative media firms create value innovations for SMEs in other sectors?
- **Research Question 2 (RQ2)**: What are the requirements for successful cross-sector collaboration between creative media companies and other sectors?
• **Research Question 3 (RQ3):** How can we understand the dynamics of this interaction process in theoretical terms?

Table 8.1 summarises research questions, literature and methods and outcomes.

| Table 8.1 |  
| Summary of research outcomes  |

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>RQ1</th>
<th>RQ2</th>
<th>RQ3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 4</td>
<td>Chapter 5</td>
<td>Chapter 6</td>
<td>Chapter 7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Qualitative descriptions of the collaborative process</th>
<th>Intervention as catalyst of innovation culture and processes</th>
<th>Grounded theory: creative interoperability of cohesive groups</th>
<th>Dynamic evolution of creative interoperability</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Participant case studies by sector</th>
<th>Longitudinal intervention; descriptions and evaluation between participants and non-participants</th>
<th>Semantic modelling of interview data</th>
<th>Semantic modelling of the evolution of the intervention through phases</th>
</tr>
</thead>
</table>


| Conclusion | Stark’s (2009) competing *heterarchies of worth* also need multiple evaluation methods. Creative interoperability value can be applied to innovation culture and further research directions such as commercialisation. |
8.2 QUALITATIVE DESCRIPTIONS OF THE COLLABORATIVE PROCESS

The investigation in Chapter 4 delivered an introductory overview of the three cases in which the intervention occurred, as well as an explanation of a rationale for the Intervention Scheme. Research Question 1 (How can creative media firms create value innovations for SMEs in other sectors?) has driven this enquiry and has been applied to each intervention case study with creative firms deploying their capabilities across sectors.

These case studies examined the participant observation data collected from the 13 participants that formed the structure of the Intervention Scheme, including each mentor. The participants were grouped by the structure of the Intervention Scheme, and the case studies demonstrated observable patterns of how organising creative resources may be replicated (Mudambi 2008). All participants in each intervention collaborated with each other to produce new and novel outcomes of value. This method produced a tentative hypothesis by combining creative-industries and open-innovation perspectives. This led to the development of the new concept of general interoperability for examining interaction and performance between collaborative groups and the Intervention Scheme. That is, the outcomes of each intervention varied significantly, providing evidence to suggest that interactions between creative and other cross-sector industries may be explained as patterns of interoperability.

Chapter 4 began with an analysis of the creative media firms involved with the Intervention Scheme, which would use their capacities in sectors outside their core industry. The three participant case studies reported on how these creative digital media firms worked with mining, education and manufacturing companies. By comparing the results of each intervention – the education case study, mining case study and manufacturing case study – it was argued that one reason for the growth in demand for creative digital services in particular, in relation to other industries, is that they drive innovation. Findings in this analysis suggested that the integration of creative components into services or products in other sectors is highly complex, and not always successful. A major finding of this chapter was the need to understand what makes such an intervention interoperable with products or services in other industries. As per the preliminary investigation and analyses, two processes appeared
to underlie this collaborative process in answering how they add value. First, brokering was necessary for partnerships between the host and the digital creative firm to occur. In the subsequent embedded phases of discovery and incubation, the bridging of knowledge systems was necessary for successful innovation. This raised two important concerns:

1. The brokering process established through the Intervention Scheme was of interest from a number of perspectives. In the literature, there was an apparent shift with innovation research from closed to open innovation (Chesbrough 2008). The characteristics of this paradigm shift are the actors, the conveyor of the idea (problem), groups or individuals that support the idea (solvers) and the brokers or network platforms (innovation intermediaries) that facilitate, coordinate or mediate the process. The role of the Intervention Scheme in the bridging process clearly resonated with open-innovation approaches, but was not formally endorsed as such in any conscious way.

2. An explanation for the embedding that occurred during the discovery and incubation phases was that of the Intervention Scheme facilitating and coordinating innovation. Although Chapters 6 and 7, using Stark (2009), ultimately questioned the role of the broker in open innovation, in Chapter 5, we identify, through Vanhaverbeke (2009), the presence of innovation intermediaries resonating with the Intervention Scheme. Additionally, we identified that the creative industries are connected with open innovation (Müller, Rammer and Trüby 2009, 158).

Müller et al. (2009) suggest that creative entrepreneurs are a source of innovation, and in an open-innovation paradigm, are therefore increasingly in demand by other sectors. The idea of embedded creative interoperability consequently set the scene for remaining chapters of this thesis (Chapters 5, 6 and 7) in order to develop an analysis of how creative entrepreneurs add value. An in-depth inquiry then ensued, pursuing the requirements for successful cross-sector collaboration. Vanhaverbeke (2009) provides a sophisticated understanding of the collaborative process as we move from the value chain to the value network. However, Chapter 4 reinforced the view that there is a lack of literature to
satisfactorily explain how knowledge flows, and how exchanges and transfers take place to innovate and appropriate value in the settings studied.

A limitation of Chapter 4 was that the results were non-comparative because of the focus on creative media workers embedded within other sectors. In Chapters 5, 6 and 7, the synergies surrounding this embedding is an important finding, which developed into an insight missing from current understandings of creative entrepreneurship and, therefore, the collaborative process. This suggested that the new notion of interoperability could be applied to understand and measure the collaborative process: this was an important finding because the literature had revealed that such measures were generally lacking in this area for SMEs and start-ups. Innovation managers, who often refer to the people side of innovation to interpret innovation culture, may gain insight towards individual cognition capacity in such group dynamics (Mitchell et al. 2002; O’Connor and McDermott 2004). For all innovation managers, but particularly in SMEs, micro-businesses and start-ups with limited resources, investment in resources that add value is critical to all areas of their business. The area of innovation process was therefore explored in consecutive chapters, through group interactions in which creative-industries firms interoperated with firms in other sectors. In Chapters 6 and 7, such dynamics were illustrated through semantic insights and support the notion of absorptive capacity and how it applies to the creative industries (Cunningham 2013; Cunningham and Higgs 2009).

8.3 INTERVENTION AS CATALYST OF INNOVATION CULTURE AND PROCESSES

The preliminary discovery of the concept of interoperability was an unexpected outcome. The principle preoccupation of Chapter 4, however, was the evaluation of cross-sector collaboration processes and outcomes. Chapter 5 delivered detailed descriptions of the wider Intervention Scheme:

- the three intervention cases across all phases of the intervention
- comparisons of non-participant cases (comparison groups) that occurred without, but at the same time as, the intervention stages
- evaluations of how well the scheme’s performance criteria were met by the outcomes of the intervention and comparison cases.
In addition, after a period without Intervention Scheme support, each participant project was revisited, providing further varied but valuable insights. Chapter 5 provided evidence that the intervention did undertake the role as catalyst and thus influenced significant real-world commercial outcomes, which can be partly attributed to the processes and culture of the Intervention Scheme. This finding highlights the significance of the research opportunity in this thesis, in observing a large, well-funded, real-world experiment that ran for two years, with individual interventions occurring each six months. It also described the innovation processes and their effects, which were theorised in novel ways in Chapters 6 and 7.

Chapter 5 described the intervention evaluation in detail and can be thought of as an investigation into how value was created between creative media companies and other sectors to identify the requirements necessary for successful cross-sector collaboration. Longitudinal intervention descriptions and evaluations between participants and non-participants\textsuperscript{62} were based on interviews with members of both groups during the six-month period in which the scheme operated. Participants were interviewed three times using semi-structured questions: at the beginning of the scheme (\textit{pre-scheme}), in the middle of the scheme (\textit{mid-scheme}), and at the end of the scheme, as outcomes were reached (\textit{post-scheme}). The two sets of interviews with non-participants (which were categorised as comparison groups according to the Intervention Scheme region they applied for) were also semi-structured and similarly timed. The relevance of this approach was to describe the Intervention Scheme nexus concerning linkages that were formed, to describe control-group comparisons in which no obvious innovation intermediaries were present, and then to evaluate the linkages based on the Intervention Scheme criteria. The evaluation then had a reflective analysis whereby Intervention Scheme mentors also provided a summary of outcomes both through formal interviews at the \textit{post-scheme} stage and survey data collected a further six months afterwards.

Chapter 5 noted critical observations inferred from outcomes for non-participants, which acted as comparison groups. In a similar intervention, Bakhshi et al. (2013) compares how these groups act as an important \textit{constraint} against biases of

\textsuperscript{62} Non-participants were host and creative firms who applied to be part of the Intervention Scheme but were unsuccessful.
the researcher and the focus of the action-research results themselves. Similarly, the case descriptions in Chapter 5 highlight that, as part of the design of the Intervention Scheme, the role of the intermediary was designed to, and in fact did, contribute to the successes of participants engaging with innovation projects. The results were definitely mixed and less obvious for the non-participant firms, arguably because no intermediary was present with these comparison groups. As with Bakhshi et al. (2013), divergent results were more obvious at the time when the Intervention Scheme was complete, compared with six months afterwards. Six months after the intervention the results for the comparison groups ranged dramatically:

- some firms had not experienced any innovation progress at all
- one firm refocused on business growth, which led to a high-profile global platform acquisition
- one participant creative and non-participant host experienced a successful collaboration as an indirect outcome through the scheme.

These longer-term results are comparable to the intervention groups’ long-term results, and reflect the perhaps obvious fact that comparison groups in real life experiments do not just give up. This does not undercut the importance of the brokerage of the Intervention Scheme acting as intermediary: indeed, one of the non-participant group successes came through indirect connection to the scheme.

However, innovation managers may glean from this that innovation culture requires continual stimulation and nurturing. Up to the incubation stage, there is convincing evidence through Chapter 5’s evaluation, that the Intervention Scheme provided significant structural innovation support to enable group performance. It is therefore possible to infer that there were varying levels of business growth in the longer term because there was no intervention during the subsequent acceleration phases. However, this suggests another question: If the creative industries are drivers of demand, why was this not evident in the cases of the mining and manufacturing projects after the intervention? It also raises further questions surrounding the role of the innovation intermediary, (i.e. the Intervention Scheme), and the requirements for the collaborative exchanges that took place. Analysis in both this and previous chapters was only able to explain Intervention Scheme interactions through concepts of brokering and bridging in forming partnerships and knowledge exchanges.
However, as noted in the Chapter 2, Stark (2009) suggests that innovation is not necessarily caused by these conditions and that generating new knowledge favours some familiar connections. The diverse nature of creative groups also supports the notion that, in addition to their creative assets, they have the capability to act as a catalyst between groups.

An extension of this argument draws on the notion that the value network is the means by which firms are able to support commercial objectives through partnerships, vendor and supplier relationships, customers and sales. Open innovation is one method by which these relationships focus on developing new products or services and leverage existing resources by combining with further externalities. The Intervention Scheme, in creating a role that is therefore broader than an individual innovation intermediary, acted as a system by which knowledge flows and transference occurred between organisations seeking to innovate and develop new value networks. For example, new markets were identified in each intervention:

- education: the NeuroSmart product expanded from children to adults
- mining: from open-pit mining in Australia, to underground mining in Asia
- manufacturing: overseas distribution was developed through franchising.

The innovation process was hence facilitated by the intermediary intervention, first by brokering and bridging partnerships (match-making), then by embedding creatives over a fixed time period to deliver combined outcomes. Structural holes (Burt 2009) unique to each group (and sector) were identified and brokered by the intermediary, bridged by the process of the intervention, and structurally folded into an enduring intercohesive relationship (i.e. formal commercial partnerships) (Stark 2009; Vedres and Stark 2010). Interoperability can be seen as a further method by which we aim to understand the Intervention Scheme as a system during the creative embedded phases of discovery and incubation. The aim of this theory is to provide insights into cross-sectoral and creative innovation processes. This not only contributes to the development of an interpretive framework than can measure complex innovation systems, but ultimately, may extend its usefulness to policy makers reproducing and deploying the systems and methods identified into the wider knowledge economy.
Chapter 5 also provided evidence that the intervention served as a catalyst of innovation culture and processes, employing evaluation methods based on open innovation and the D-I-A model shown in Figure 5.1. Hence, this model of the stages necessary for innovation regardless of sector (or creative media) was adopted throughout this thesis. After the literature review in Chapter 2, the D-I-A model proved relevant because not only do open innovation leaders advocate the model (Lindegaard 2010), but it is also applicable to any sector. The literature review found few models that were not skewed towards certain sectors that were first inclusive of collaborations with creative industries, and second, particular to small businesses such as SMEs and start-ups.

Social network analysis provides new methods of evaluation for overlapping groups, entrepreneurship and innovation (Stark 2009). When using qualitative methods, even with a relatively small sample and data collection size, the Intervention Scheme reproduced the conditions of a complex system. Hence, the next step in this research was to undertake analyses of group interactions to understand further the dynamics and knowledge flows.

8.4 GROUNDED THEORY: CREATIVE INTEROPERABILITY OF COHESIVE GROUPS

In Chapter 6, the innovation processes evidenced in the Intervention Scheme were theorised in novel ways by mapping processes. Semantic modelling was used to analyse interview data using social network analysis of the discursive layer, specifically with Leximancer software. This modelling process required the assessment of various software options and lengthy empirical topology testing. Chapter 6 described the semantic network structure that operated in each intervention, and the idea of creative interoperability was introduced in theoretical terms. In the construction of grounded theory, we mapped participant and non-participant semantics and compared them in order to determine which group interactions occurred. As with Chapter 5, in the context of the Intervention Scheme achieving significant results, the addition of control-group analysis within the corpus enabled a level of bias elimination through group comparisons that would not have otherwise been possible.
To understand the dynamics of this interaction process, Leximancer software was employed to assemble the interview transcripts into semantic network forms. The use of this software was explained and justified. Network mapping tools have generally been used in quantitative research; they have only recently become viable for qualitative researchers, and therefore, their use in qualitative research is often misunderstood. Corbin and Strauss (1994) advocate the benefits to the research process if such software is used appropriately. One common mistake is to assume that the software may be used for quick technological processing and bypassing rigorous analysis. In contrast, in this study, the modelling process to appropriately simulate the group structures of both participant and non-participant groups became meticulous and arduous. However, the complete setup of topologies enabled fluid results and rewarding analysis grounded in the data (Charmaz 2006), producing the ability to replicate findings and compare results across multiple instances (as was done in Chapter 6). In addition, using Leximancer means that both the method and data analysis may be replicated, reducing the bias of the researcher. The ability to construct grounded theory using such software was in itself an exciting, innovative and unexpected outcome of this research.

Using this software, Chapter 6 explored the nexus of relationships in the Intervention Scheme by also comparing the discursive layers of non-participants in parallel. By comparing the group relations and network structures that occurred, we mapped the discursive layer, which demonstrated how embedded creative firms cooperated with firms in other sectors. These network structures were then explained as a theoretical model for creative interoperability. By comparing knowledge networks between groups, using abductive methods (Osei Bryson and Ngwenyama 2011), we developed the three components of the *interoperability theoretical framework*:

- *organisational interoperability*, wherein project goals and processes are aligned by participating organisations
- *semantic interoperability*, which involves shared-language meaning, and thus, dynamic capabilities
• knowledge interoperability, which facilitates specialist subject knowledge exchanges that require processes to embed both creative capabilities and open collaboration models.

For innovation managers, this framework proposes that knowledge exchanges involving the creative industries depend on a further opening of network models, but also that open innovation in practice needs to widen its processes of knowledge exchanges to include embedding commercial mediation. The transition of creative innovation and a longitudinal analysis of commercialisation and business growth is a point of departure for the chapter. The creative industries as a domain has the diversity to embrace multi-level interoperability (e.g. systems, products, networks) and create value. As a means for fostering entrepreneurship throughout the creative economy, understanding creative interoperability at various levels of the innovation system may elucidate the conditions for co-innovation, rather than further confuse the “dynamics of change” (Cunningham 2013, 12). At this fledgling level of theory building, this is a key insight for future innovation research. Our data suggest that interoperability must accompany diversity:

Whilst diversity is an important feature of healthy and evolving systems, the degree of specialization in concerns shown by the different groups is most valuable when there is evidence of connections, shared concerns and common interests within the national innovation system. (Dodgson 2008, 3)

Further research is required, however, to identify systems interoperability and when and where structural holes and structural folding occurred in the study. We can surmise at this stage that structural holes were brokered during the pre-pilot stages of the scheme. We suggest that the bridging and structural folding occurred during the discovery and incubation phases respectively; however, this was not yet absolutely verifiable through the analyses conducted. It was necessary to determine this point of folding with certainty before confidently claiming that intercohesion occurred. This topic was investigated in Chapter 7, where we adopted a temporal analysis of participants across the timeline of the Intervention Scheme, again using Leximancer.
8.5 DYNAMIC EVOLUTION OF CREATIVE INTEROPERABILITY: A NEW CONCEPT TO GUIDE, UNDERSTAND AND EVALUATE INNOVATION BY CROSS-SECTOR COLLABORATION

Chapter 7 further refined notions of interoperability into the idea of creative interoperability. In this study, the creative interoperability theoretical framework in Table 7.1 was applied to cross-sector innovation and further semantic network analyses were conducted. The longitudinal change in the semantic network structure throughout the intervention was mapped. This was theorised in terms of the difference between structural holes (Burt 1992) and structural folds (Stark and Vedres 2013). The three components of the interoperability theoretical framework (organisational interoperability, semantic interoperability and knowledge interoperability) were used to explain systemic interactions in each of the Intervention Scheme’s collaborations over time (e.g. Table 7.1).

Using existing theoretical perspectives, this research made it possible to apply entrepreneurial models to SMEs and explain the knowledge flows necessary for cooperation and co-creation. At the same time, it suggested creative interoperability as an extensible testable process throughout innovation systems. This study broadens the examination of group interactions by revealing co-creation methods of intersecting groups, within an Intervention Scheme in which digital creative firms formed new groups with firms from other sectors. As in Chapter 6, the importance of structural folding for creative interoperability was argued for, and demonstrated. This perspective also stimulated a critique of open innovation concerning SMEs and the role of innovation intermediaries, predominantly in the pre-selection and discovery stages of each project.

As a test, if we ignore Stark’s (2009) problem of entrepreneurship to the alternative that it is access to information, then innovation intermediaries would be less relevant beyond the incubation stages. As we have proven in each case, the Intervention Scheme processes and ties emerged over time, while intersecting with structures that may not necessarily develop. However, if the problem is framed as one of generating new knowledge, as Stark (2009) argues, creative groups are better placed to be the carriers of demand as well as supply through intercohesive strong ties (Cunningham 2013). The acceleration phase therefore requires closer attention in relation to enterprise growth in creative industries, inclusive of SMEs and start-
ups. The exclusion of start-ups, micro-businesses and SMEs more broadly in research is indicative of a resistance to the transition towards a knowledge economy. The focus on predictable growth, with businesses that already have sufficient turnover, tends to neglect innovation and entrepreneurship. The role of innovation intermediaries that broker, bridge, coordinate and facilitate knowledge transfer within the complex networks of open innovation are evident in the current study. In terms of the lineage of previous policy experiments (e.g. Bakhshi et al. 2013), which influenced the research design of the Intervention Scheme, both the theory of creative interoperability and the methodological linkages between a grounded qualitative framework and data analytical tools, may be of value to future studies of such innovation processes.

Open innovation and innovation intermediary networks are themselves continuing to grow at a similar rate; however, for innovation managers, it is no less clear how to assess these models against business growth. These networks are, however, targeting innovation-management products that broaden their capabilities towards additional products and services, such as workflow software systems or consultancy services. It is this last, and important, business growth stage (i.e. acceleration) that proved the most elusive for the intervention, as demonstrated in Chapter 7. Commercialisation and market assessment is one method: as noted in the previous section, the creative industries and open innovations intermediaries (so they claim) are facilitators of both supply and demand who can help both sides of the market (Vanhaverbeke 2009). The conceptualisation of the thesis began with an examination of literature about networks with phenomena such as equity, crowdsourcing and crowdfunding. Through interoperability between social media content recombinations, these occurrences actuate, for instance, websites such as Kickstarter, Indiegogo and Pozible. Although such networks are far from perfect forms of equity raising (inclusive of misleading statements of projects, inappropriate claims and inadequate due diligence), it is conceivable that this trend will continue to develop and mature. If so, as more entrepreneurs and policy makers intervene, we

63 These are a few highlights on an ever-growing list. These types of sites are certainly not without their critics and there are well-documented controversies including patent disputes and project cancellations.
anticipate a greater demand for diversity of evaluation methods for the acceleration stage for innovations to genuinely prosper.

Intercohesion (Stark 2009) appears as a longer-term process than may be possible for small-sized projects or organisations. Interoperability suggests a more suitable explanation that is inclusive of the short-termism of SMEs. This is noteworthy when considering the macro-innovation system and in general, as open innovation suggests, that big companies can’t do small things well (Mayer, Somaya, and Williamson 2012). The search for the activation points of interoperability along the value network is necessary for implementing and executing the new knowledge generated.

Thrift (2005) defines capitalism not as a complete system, but as a set of networks evolving indefinitely. Informed by (Stark 2009), the current research expands this definition: it is an evolving ecology of simultaneous processes of convergence and divergence in the search for integrated meanings, integrating knowledges of knowledges. We also note that Cunningham (2013) points to integrated meaning through the absorptive capacity of the creative sector and its capabilities to recover quickly and adapt to change brought by uncertain and unfixed innovation processes. Creative economies are therefore also understood as integrated value networks because they contribute to wider innovation systems, integrating both supply and demand (Cunningham and Higgs 2009) by appropriating and repurposing innovation to form new discursive group patterns. Simmel (1898) proposed that social groups be described as a web of relationships and (as a founder of network analysis) argued that networks are both structure and process at the same time. Stark’s (2009) more recent network analysis explains new organisational forms as heterarchical, heterogeneous systems that consist of the continuous evaluation of interwoven multidisciplinary performance principles. More recently, de Vaan, Vedres and Stark (2014) developed the notion of folded diversity to suggest that these activation points are not necessarily related to social distance (as with normative social network analysis) but with cognitive distance, associated with examinations using CAQDAS and Leximancer in Chapters 6 and 7. As de Vaan et al. (2014, 8) suggest: “Where cognitive distance is great, even a primitive lexicon can be an opportune starting point for a truly creative innovation”.

Chapter 8: Conclusions
Social network analysis and the study of patterns and ties in relational settings, according to Mische (2011), form relational sociology to overcome traditional antinomies between structure and agency (Carrington and Scott 2011, 88). Mische identifies further contradictions, such as the tensions between epistemology versus ontology, when grounded in interpretation of relationships (Carrington and Scott 2011). Both Mische (2011) and Stark (2009) advocate that understanding these tensions, frictions and dilemmas as both productive and creative is entrepreneurial as long as they may disrupt the norm to produce innovation and can be organised and harnessed through innovation systems. Therefore, the value network is a heterarchy of worth that is complex and adaptive under constant evolutionary change.

The creative interoperability in systems such as creative economies may be one set of networks in which the serving of self-interest is also a system of serving the wider interest. It is unclear at which points these systems are recursive and self-replicating; however, uncovering these dynamics will help understand the underlying network structures surrounding resilience. This concept also stems from the idea of embedding capabilities: the dynamic capabilities view developed through the analysis of absorptive capacity that the creative industries are creators of both supply and demand (Cunningham 2013). This conceivably has strong ties with economics, but like soft innovation and hidden innovation, it would seem that the value of demand may have been underestimated in mainstream schools of economics thus far (Potts 2011). Its absence is significant to SMEs and start-ups and the lack of interoperability among creative industries, innovation and mainstream economics (Cunningham 2013, 14). An explanation at this stage is unsupported by empirical data, but as Chapter 7 argues, it is for the creative industries to preserve the diversity of creative value necessary for innovation and perpetuate it through other sectors.

8.6 CAVEATS AND LIMITATIONS

Like all research, this study has limitations. The author has employed a variety of mixed methods in these chapters, and this in itself carries certain risks. For example, being involved as an insider observer in the intervention may be seen as a

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64 Not to be confused with soft economy, which indicates a recession when there is more supply than demand.
source of bias. However, Leximancer\textsuperscript{65} was used in Chapters 6 and 7 and was employed for complex qualitative data analysis, following the outcomes of Chapters 5 and 6, in order to moderate the intense immersion associated with the action-research phase. That is, although some researchers could consider this high level of engagement with the interview subjects as interference with the analysis, the dependence on verbatim interview data through the use of this software arguably increased the objectivity of the researcher and reduced researcher bias (Charmaz 2006; Corbin and Strauss 1994; Denzin et al. 2009; Yin 2003). The second caveat also concerns the limitations of empirical data and theory building using mixed methods, particularly abductive reasoning (Osei Bryson and Ngwenyama 2013; Reichertz 2010; Timmermans and Tavory 2012). The post-hoc theory building typical of the abductive approach may be seen as untested and highly speculative. It is important to acknowledge firstly that no claim is made that the theory has been tested rigorously. Equally though, it is important to point out that the final summations emanating from Leximancer are underpinned by quantitative derived semantic patterns in the interview transcripts across all the participant groups. Both of these caveats are extremely important to acknowledge, not only for ethical reasons, but also for framing the nature of the developed theory. Future studies are needed to test this theory and the thesis conclusions in general. Hence, limitations have been recognised to also define areas of future research.

8.7 FUTURE RESEARCH

The theory of creative interoperability developed through this study could be embraced by other disciplines. In particular, these six branches of (interdisciplinary) knowledge have research potential in relation to creative interoperability.

1. Qualitative versus quantitative methods
2. Social network analysis
3. Business modelling
4. Evolutionary economics

\textsuperscript{65} Significant time was invested exploring other qualitative software such as NVivo and Discursis. Both were unable to adequately interrogate the data gathered for several reasons: the data was too complex, the study did not have enough resources to invest in manual coding, or importantly, the overall research design did not match the comparative research design.
5. Policy measures

6. Points of departure

Each is discussed in more detail in the sections that follow, including an extension of the literature review (Chapter 2), by suggesting important areas for future research that were not permitted by scope and topic relevance.

8.7.1 Qualitative versus quantitative methods

Unsurprisingly, the limitations of this study fall within customary debates of qualitative versus quantitative methods. In this case, had it not been for the qualitative approach adopted, a theory of creative interoperability might not have been developed with a complexity and rigour in keeping with Stark’s (2009) value of worth. Limitations of this study only hint at the suggestion that interoperability may fruitfully be formalised beyond qualitative methods. The empirical study of the discovery and incubation of structural folds for small groups has been applied: however, it is yet to be proven, at least within the empirical data that is available in this study.

8.7.2 Social network analysis

An arena that extends to both qualitative and quantitative methods is social network analysis. The study in Chapter 7 illustrated patterns and ties in relational settings, which, according to Mische (2011), form a relational sociology to overcome traditional antinomies between structure and agency (Carrington and Scott 2011, 88). Mische identifies further contradictions, such as the tensions between epistemology and ontology, when grounded in the interpretation of relationships (Carrington and Scott 2011). Both Mische (2011) and Stark’s (2009) network analysis advocate that we can understand these tensions, frictions and dilemmas as both productive and creative and therefore entrepreneurial, and they can be organised and harnessed through innovation systems. Progress in understanding such antinomies may be enabled through social network analysis methods, which measure the structural properties of groups as patterns of nodes and ties (or edges) of social relationships between individuals and assess the level of reciprocation. Further enriched by technological advances, including accessible computing and the broadening of
algorithmic methods that subdivide clique percolation,\textsuperscript{66} the analysis of complex networks is also improving the ability to measure overlapping communities and groups (Stark and Vedres 2009). Quantitative methods developed through mathematical formalisations and further advances in group theory elucidate cooperation strategies with competitive systems, such as game theory and evolutionary dynamics (Rand and Nowak 2013).

8.7.3 Business modelling

The performance measures and evaluation methods available for innovation managers are either poor, limited or highly subjective, and are specialised for SMEs, micro-businesses and start-ups. Innovations are generally most successfully assessed by the market: out of the firms investigated in this study, several ceased trading, one of which was a participant of the Intervention Scheme. Measuring innovation for SMEs and micros is therefore an important direction for future research. Such innovation measurement could investigate, for instance, systems and process interoperability, and test it through business models. This could also even capture the recursive nature of business and allow it to be reconceptualised because business models pivot through cycles of business change as they interact with various points of resilience throughout value networks (Arteaga and Hyland 2013; Cunningham 2013; Vanhaverbeke and Cloodt 2006).

For example, in Business Model Generation, Osterwalder (2010) described the case of Nespresso,\textsuperscript{67} suggesting that the company’s IP lies not solely with its products, but also in its Customer Relationship Management (CRM) software. Alongside commoditised FMCG products driving a commodity business model, Nespresso’s software systems allow the company to understand its customer segments’ actions. Nespresso is then able to data-mine further user-driven insights, which in turn determine the marketing strategy. It could be argued that the recombination and interoperability between systems, product and user interactions are a continual source of new knowledge and innovation. Osterwalder describes

\textsuperscript{66} For more on identifying cohesive groups with Clique Percolation Method (CPM) see Stark and Vedres (2009).

\textsuperscript{67} Nespresso is a company owned by a Swiss food maker Nestlé and is also the owner of Nescafé, which is considered a separate business model. Nespresso was first patented in 1976, and in 2008, it achieved revenues of approximately US$101billion.
Nespresso as an “ambidextrous” company derived from business thinkers O’Reilly and Tushman (2004 in Osterwalder 2010, 232). The word ambidextrous refers to a firms’ ability to simultaneously manage multiple business models (Osterwalder 2010). On one hand, these types of businesses are able to apply new innovation models, while with the other, they operate the existing models. For SMEs, the latter is especially critical because the existing (single) model drives cash flow and revenue. During this study, we were able to garner sufficient evidence of the Intervention Scheme’s participant business models pivoting, which in the case study of Nespresso is also a demonstration of how businesses evolve, adapt and change by design. However, this question remains unanswered: What dynamic capabilities can be designed and implemented to interact with value networks and ecosystems? Through the literature, the concept of creative interoperability patterns of co-creating value ecologies (Hearn and Pace 2006) may also glean business model generation theories. An area in combination with corporate foresight (Johnston 2010), for instance, may also prove fruitful for future research in connection with innovation cultures. One possibility is the study of co-innovation, which explores the concepts of collaborative networked organisations (Romero and Molina 2011) and convergenomics (Lee, Olson and Trimi 2012) by linking interoperability in collaborative processes with economic approaches. This is an area that has started to emerge that explores collaboration, but is currently less paradigmatic than open innovation, and has resonance with systems thinking and value networks.

**8.7.4 Evolutionary economics**

As a PhD student within the ARC Centre of Excellence for Creative Industries and Innovation, the candidate was aware of new theoretical work linking creative industries and evolutionary economics (Potts 2011). Schumpeter (1942) rejected the idea that entrepreneurs and artists were opposing and unconnected, and began to model the two groups together.68 This transformative process forms, among other things, the basis of evolutionary economics: an eco-system of heterogeneous disciplines inspired by economics, evolutionary biology and cultural science (Hartley

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68 Most famously, Schumpeter coined the term creative destruction, which is still used today by both academics and practitioners to account for the dynamic processes by which entrepreneurs introduce innovations through disruptive technologies.
2014). Artists, for instance, can also be seen as economic agents, a key concept in explaining the role of the entrepreneur in Schumpeter’s theory of innovation (Hartley 2014).

*Evolutionary methodologies* is an area of research that has been influential in the humanities, especially in relation to E. O. Wilson’s (1999) concept of *consilience* in bridging knowledge gaps between other disciplines. While maintaining the idea that cultural understanding will eventually *fold* with science and the two will partly *fuse*, Wilson (1999) connects and ties the traces between *genes and culture*, for instance, in the comparison of human cooperation with biological eusociality. Stark (2009) illustrates this point through *heterarchies of worth* by calling for more diversity in evaluation methods because, as Wilson suggests, change is reproduced at such a rate that is almost incomprehensible. As Stark argues, “productivity” metrics are ineffectual because innovation “potential is spread across a spectrum of known and as yet unimagined human needs” (Stark 2009, 493). The theory of creative interoperability can be applied to innovation culture, and further research could determine whether in turn it may be applied within the alternatives to evaluative forms within evolutionary economics. When critiquing policy makers in the exclusion of soft innovation dynamics, for instance, Potts (2011) calls for more consideration towards evolutionary (rather than mainstream) economics, which includes its subtleties and complexities (Cunningham 2013).

8.7.5 Policy measures

For policy measures, Potts (2012) provides a framework of three levels – *micro, meso* and *macro* – which the current study has found valuable in examining knowledge flows and ideas that are adapted by agents in the system. The mid layer, *meso*, is characterised by *groupish* behaviours and forms a basis of transference that is illustrated by organisations and intuitions. However, this *meso* level is problematic if we apply the findings in the study through the lens of a comprehensive entrepreneurial ecosystem that includes small enterprises or start-ups. Although the *meso* level analytical framework may resonate in terms of creative industries policy making, it makes less sense when applied to the problems of open innovation and SMEs. Large organisations, once established as such, are challenged by needing to access external ideas in order to innovate. SMEs are one such source, and as this
study has shown through Stark (2009), access to knowledge is not the whole solution – it is the embedding and intercohesion between groups that generates the new knowledge and ideas needed to innovate. As noted in this study, possible areas for further research surround the challenges of entrepreneurship in determining points of interaction between organisational interoperability, semantic interoperability and knowledge interoperability, more broadly, the synergies between value networks and ecosystems. Potts draws on the absorptive capabilities of groups, such as those embodied by the creative industries that evolve creative ideas.

As identified in Chapter 4, creative firms are capable of generating both supply and demand. However, as theories of soft innovation (Stoneman 2010) and hidden innovation (Cunningham 2013) emerge, it is obvious that the balance of supply (sole purpose) and demand (multi-purpose) in the creative process is also highly complex. Potts (in Cunningham 2013, 14) raises concerns that these conditions prove difficult for practical policy makers in the exclusion of theories, such as soft innovation, in future interventions funded by the public sector.

Creative interoperability conceptualises soft, hidden and open typologies because they present innovation as systemic with regard to processes, models, products and services that may even occur in a single venture as it evolves through an entrepreneurial journey. As Stark (2009) notes, and as was apparent in this study, a micro-firm may pivot through its lifecycle through many iterations of friction, disruption and group instability before creativity and innovation may be achieved (Arteaga and Hyland, 2013). Creative interoperability also attempts in part to examine interactions between the points of dilemmas and friction – which, importantly, may be observed as systemic – as complexity adds to the value network.

By developing a creative interoperability vision, a genuine innovation culture interprets the intersections and capabilities of systems – the ability of processes, models, products and services – to interact and generate new knowledge. These intersections may not be apparent in the everyday supply of an organisation’s business activities, nor when accessing information and ideas that may already exist, for instance, in different sectors. As this study has shown, however, in all cases, the process of recombining cross-sector groups for collaboration produced new, novel and unexpected results. Although it was proven that the Intervention Scheme
fostered innovation and entrepreneurship, differences in all cases conversely supported the idea that growth is unpredictable at the micro level. Across all groups was a diversity of outcomes for all participants and non-participants. The Intervention Scheme did not focus simply on picking winners versus losers, but embarked on creating a compatible culture between groups where none had existed. According to this study’s findings, the most apparent form of creative interoperability that emerged was the discursive patterns through shared language, and the formation of new ties rather than existing ones. Interventions in the future can apply these concepts, but also extend creative interoperability to formal processes, models, products and services that may emerge (Carrington and Scott 2011).

Understanding culture and communicative process through concepts such as the meaning of ties is important for fostering innovation and entrepreneurship for the creative economy; however, the emphasis on commercialisation must not be viewed as mutually exclusive. Indeed, with regard to public policy making and nurturing each group collaboration, this should be clearly defined with reference to facilitating future programs and interventions. The theme of creative interoperability, by definition and design, also aims to elucidate the ultimate goal of innovation that is commercialised in some form. As soft, hidden and open typologies confirm, collaborations should not be kept to single-purpose processes, models, products and services, but may (even be encouraged to) pivot into multi-purpose models once use by customers drives and determines value such as cultural capital (Bourdieu and Passeron 1990).

As revealed in Chapter 7, pecuniary relationships proved to be a key factor in group collaborations, organisational value and entrepreneurialism. In the same way that open innovation is a unifying theory calling for externality (Vanhaverbeke and Cloodt 2006), for example, the inclusion of von Hippel’s (2007) user-led innovations, entrepreneurial interactions, intersections, and thus creative interoperability, should be considered testable against commercialisation and reflective market economics. This in itself is not usually a fixed and obvious solution but a process of continuous and iterative discovery, incubation and acceleration (Arteaga and Hyland, 2013). While meeting the theory’s attempts to be inclusive of notions of soft, hidden or open innovation, it also exemplifies creative
interoperability as a beginning in extending non-traditional measures that in the future may also be testable. In this study, these have been collaborative systems and processes, in combination with products and creative innovation. This study delivered a theoretical framework that identified patterns useful for innovation culture; however, of course, it is just at the beginning in relation to realising its usefulness for policy measures.

8.7.6 Conclusion

To conclude, we return to Stark (2009). The idea of interoperability has contributed to the understanding of intercohesion between groups; however, there remains much work to be done on whether interoperability can be developed into a formal measure and predictive tool of innovation for both policy makers, and in-situ, for real-world commercial environments. Crucially, creative interoperability could also inform other interventions or collaborative projects. Creative interoperability as method may indeed aid embedded behaviours throughout the value network as the theoretical framework developed suggests. With the rate of complexity and hyperentrepreneurialism intensifying, embracing discursive intercohesive patterns may become more than creative practice:

Hyperentrepreneurial capitalism is a relentless search not only for new domains of activity but also for new sources of creativity. It finds a new source in the employees of heterarchical organizations, where it learns that creativity knows fewer bounds when it can be unbound from hierarchical control. In this, it continues developments anticipated by the movement of Communities of Practice, through which organizations came to recognize that activities that were not formally organized, and which were frequently crosscutting of formal organizational boundaries, could be richly generative of creative performance. But it also finds creativity in energies that exist far outside the boundaries of any kind of professional communities, as when consumers are brought into the production process. Like the notion of “self-management,” with its positive connotations combined with Foucaultian management of the self, the notion of the consumer as producer has a doubled valence. (Stark 2009, 488)

Future interventions for entrepreneurship, therefore, may target the structural fold: this being the point of creative interoperability of capabilities, interactions and
functions. The results of this policy experiment suggests an intervention focus not on brokers per se, but on *inter-cohesive* enablers embedding *actions*, rather than simply bridging unsustainable connections. Entrepreneurship is, after all, about creativity, and repeatedly knowing where to embed and who to collaborate with to add value.
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*Foresight, 7*(6), 39–63.


Appendices

Appendix A

Intervention Scheme Expression of Interest

(Source: Reproduced and used with permission.)

The Intervention Scheme is seeking three ‘non-games’ businesses (one each in Victoria, New South Wales and Queensland) to participate in Intervention Scheme Integration Projects in 2011. These projects involved the integration of a team of creative media professionals into participating ‘non-games’ Host Businesses to explore opportunities for increased commercial competitiveness through innovation.

Host Businesses will have access to funded expertise to work on a new project, design or system using interactive media skills that will help the business achieve commercial outcomes. The Intervention Scheme will provide funding contribution, expert innovation facilitation, mentors, researchers and student resources as part of the pilot [projects of the Intervention Scheme].

Expressions of Interest (EOIs) are now being sought from businesses and/or practitioners to participate in the Intervention Scheme Integration Projects as either:

- Business from a ‘non-games’ industry sector; or
- Creative Media company/professionals

Non-games industry sectors are those industries outside entertainment games sectors. Host Businesses may come from, but are not limited to industry sectors such as health, education, agriculture, environmental/clean technology, manufacturing and business service. They can be public or private enterprises.

The project aims to research, model and showcase strategies for integrating creative media expertise across ‘non-games’ industry sectors through a series of customised business, education and workforce interventions.

Why participate in intervention scheme projects?
Why is the Intervention Scheme so important and relevant for Australian business?

**The market demands it.**

Given the advent of higher broadband speeds available to Australians through the roll-out of the NBN, customer interactivity is increasingly underpinning the way businesses, institutions and public-service sectors deliver their products and services. The mechanics and design processes traditionally employed in game-play are also increasingly being applied to broader product/service delivery applications.

The result is new ways of engaging clients, customers and stakeholders and operating business process.

**Research supports it.**

The ABS reported this year that businesses that used sophisticated types of information and communications technology (ICT) were significantly more likely to undertake innovation. Additionally, it found that the more intense ICT users were likely to undertake more types of innovation, more novel innovations and were more likely to develop innovations internally (Australian Bureau of Statistics, Business Innovation and the Use of Information and Communications Technology Research Paper 2011).

The Intervention Scheme looks to work with ‘non-games’ industry sectors to explore these opportunities arising from the application of creative capability. Some case study examples of games-based applications which have already been successfully applied to ‘non-games’ industry sectors are provided at the end of this document.

Intervention Scheme Projects promote transformation through collaboration. Inter-organisational collaboration is being heralded as one of the most effective methods for fostering innovation and creativity in business.

When two or more organisations with different cultures, practices and processes work together they are able to innovate the way in which they solve problems and also the way they work, thus leading to significant innovations and transformations in not only what they produce, but also how they produce it (Bjorkeng, Clegg & Pitsis, 2009).
The Intervention Scheme Management Team philosophy. Projects should be the mechanisms through which organisations are able to innovate and transform what they do, and how they do it. As such, through the Intervention Scheme Projects, leading thinkers in inter-organisational collaboration, creativity and business transformation are brought together to facilitate collaboration between small dynamic creative media/game design their products and services.

**What are the benefits for Host Businesses?**

Host Businesses participating in the Intervention Scheme Projects will be exposed to a range of key commercial benefits, including:

- Access the latest expertise in creative media to target key growth areas in your organisation;
- Access to funded expertise to broaden your organisation’s strategic thinking and innovation capability to take forward a new project, design or system to benefit your organisation;
- Participation in a project which is designed to transform your business with dedicated coaching and mentoring support to support you each step of the way;
- Accelerated ways for your organisation developing new services and/or original Intellectual Property to strengthen your competitive market differentiation;
- Ability to connect with professionals and leaders in creative business transformation to help your future growth and development;

**What does the Intervention Scheme provide for participants?**

Host Businesses:

A team of Interactive Media professionals ‘integrated’ into your organisation for an agreed period of time to work on a project that has been developed by your organisation using creative media skills.

- Up to AU$75,000 of paid Interactive Media expertise to deliver your project.
• Opportunity for improved business practices or Intellectual Property development linked to your selected project.

• Professional Development of key staff involved in working on the project.

• Access to the Intervention Scheme "toolkit" and expert business advisors/mentors to support and guide you through the project.

Creative Media Businesses:

Engagement with ‘non-games’ industry sectors to explore opportunities for innovation creation.

• Professional Development in the ‘non-games’ industry sector.

• The Intervention Scheme provides up to AUS$75,000 cash for your time, expertise and involvement – Host Businesses are expected to match these funds through cash and/or in-kind contributions.

• Intellectual Property development.

• Access to the intervention Scheme Integration Toolkit and expert business advisors/mentors.
Appendix B

Eligibility Requirements and Selection Criteria

(Source: Reproduced and used with permission.)

Following application, the selection criteria for the host companies were as follows:

**Host firm eligibility requirements**

All organisations applying for involvement in an Intervention Scheme Project are required to demonstrate the following Eligibility Requirements. The company or organisation must have:

- Been trading for over three (3) years with established Australian operations. (ACN/ABN\(^{69}\) should be provided as a minimum).
- Senior level management support for your participation (including the owner).
- A willingness to work with the Intervention Scheme Project Team, and more specifically, the Project Director and appointed Mentor to help support outcomes for your business and commitment to action agreed priorities.
- A willingness to share IP or other tangible assets that may be generated through the Project with the ‘integrated’ Interactive Media Team.
- A commitment to participate in project meetings, project evaluation and case study materials to disseminate the impact and outcomes associated with the Intervention Scheme Project.

**Host firm selection criteria**

A comparative assessment will be undertaken on applications based on the following Selection Criteria:

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\(^{69}\) Australian Company Number and derivative Australian Business Number are operated by the Australian Tax Office (ATO) to facilitate business identity.
• A clearly identified project or business area in your organisation that can benefit from interactive media levels in accessing new customers, markets, internal processes or research capabilities.

• A commitment to fostering innovation and growth by utilising interactive media.

• A commitment to match the in-kind and direct costs of an Integration Project. The Program will fund each integration with up to $AU75,000. Pending the scope of a final project, Host Businesses will be expected to commit cash and/or in-kind support up to $AU75,000.

• A previous track record of innovative practice and resource capability to support integration teams possibly including internships to operate within your key business operations.

• Ability to take forward new market opportunities and a willingness to pursue strategic transformation as a core part of your business strategy.

• The capability and senior level commitment to take forward the recommendations of the interactive media project to the next level (e.g. prototyping, market testing, commercialisation, export etc.).

**Intervention Scheme creative media eligibility and selection**

Involvement in an Intervention Scheme will provide Interactive Media practitioners with an extraordinary opportunity to extend their skills across industry sector boundaries and bolster their professional development. Working closely with dedicated business transformation mentors and experts from selected industry sectors, Interactive Media professionals involved in the Scheme Intervention project will be actively involved in establishing original intellectual property as they apply interactive media design/mechanics through an innovation-process toolkit, developed exclusively for the Intervention Scheme program. Please note, this document should be read in conjunction with the Intervention Scheme Expression of Interest Form which provides more detailed information on the project.
Creative media firm eligibility requirements

All interactive media professionals applying for involvement with an Intervention Scheme project are required to demonstrate the following Eligibility Requirements:

- Over 3 years working in the interactive media industry (particularly in multi-disciplinary teams).
- If on behalf of a company/organisation, the application must have senior level management buy-in (including the owner) for participation with ISIS.
- If not part of an existing professional team, individuals must have willingness to partner with like-minded interactive media professionals to deliver requirements of Intervention Scheme project and Host Business.
- Strong customer service skills to support and communicate project deliverables and required outcomes to Intervention Scheme Project Director and Mentor.
- Willingness to work with the Intervention Scheme Project Mentor to help support outcomes for the Host Business and commitment to action agreed priorities.
- Preparedness to feedback on Intervention Scheme Toolkit and procedures.
- Willingness to share IP or other tangible assets generated through the project with the Host Business.
- Commitment to participate in project meetings, project evaluation and case study materials to disseminate the impact and outcomes associated with the Intervention Scheme Project.

Creative firm selection criteria

- Experience in multi-disciplinary teams within an interactive media development company/organisation.
- Experience in applying new/novel approaches in interactive media to problem solve and deliver end to end service innovation.
• Creative problem-solving abilities and experience outside of the games industry would be a clear advantage in working to deliver Intervention Scheme Project outcomes.

• Ability to work with the selected Host Business to map and translate their required project outcomes into an interactive media based solution.

• How you feel involvement with the Intervention Scheme Program would help your professional development and your ability to deliver tangible results for the selected Host Business.